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FOREIGN MILITARY REVIEW

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Perestroyka and the Ideology of Renewal

18010693a Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 3-6

[Unattributed lead article]

[Text] As emphasized at the 19th All-Union CPSU Conference, perestroyka is the only possible way to strengthen and develop socialism and resolve pressing problems of social development in the people's interests. Perestroyka is entering deeper and deeper into our reality and exerting a transforming effect on it. Herein lies the essence of the situation in the country. The last three years in the life of the USSR can rightfully be called pivotal: the slide toward a crisis in the economic, social and spiritual spheres was stopped; society is consolidating and Soviet citizens' creative activeness is on the upswing under the influence and ideas of perestroyka; and democratization and glasnost have radically altered the ideological-political and moral atmosphere.

Meanwhile the 19th All-Union Party Conference noted that perestroyka processes are occurring in a contradictory, complex, and difficult manner and in the opposition of old and new. Reasons for the difficulty are the deterring effect of the grave heritage of stagnation; shortcomings in the work of party, state and economic entities and public organizations, which function without proper persistence or purpose; the conservatism, inertia and inability of many management staff personnel, their lack of desire to give up command-administrative methods, and the attempt to limit themselves to half-measures; and the temporizing and indecisiveness of a number of party organizations in fighting what is obsolete and in mastering new forms and methods of work.

Following the April 1985 CPSU Central Committee Plenum the party began to consistently scrap existing stereotypes in all spheres of Soviet society's life and activities, including ideology. The ideology of perestroyka represents the modern stage in Marxism-Leninism's development brought about by needs to restore Leninist theory. Deviations from this theory left a heavy imprint on ideology: its theoretical level fell, propaganda often went contrary to the realities of life, and a gap formed between word and deed. All this led to a weakening of the party's ideological influence on the masses.

The February 1988 CPSU Central Committee Plenum thoroughly analyzed the stage of perestroyka that has been covered and set forth a program for its ideological support. This includes shaping and introducing to people's awareness a set of views, ideas and notions about the necessity, substance, content and principal ways of transforming all aspects of the life of Soviet society. In other words, it is a question of developing an ideology of renewal; it is a question of agitation, propaganda and political-education work by party organizations, the mass media and public institutions for shaping a "perestroyka" awareness in the individual.

As a system of ideas and views, the ideology of perestroyka has a critical, revolutionary character. It is based on the dialectical method which disclaims dogmatism, scholasticism, fanaticism and authoritarianism and which makes it obligatory to clarify the contradictions existing in society and outline ways to resolve them. This ideology is based on a sober assessment of social development processes; it is directed toward accomplishing practical tasks; it combines within itself a bold search, discussions, and a pluralism of opinions with a striving to find the true answer to vitally important questions and with a constructive approach to solving problems of perestroyka and to renewing socialism on the basis of the Leninist concept.

Everything said about the essence of ideological support of perestroyka in society also relates fully to the Armed Forces. Supporting perestroyka ideologically in the Army and Navy means to scientifically substantiate the role of the human factor in defending socialist achievements and in improving quality parameters with respect to technology, science and personnel; and to become aware of the essence of new political thinking and its interrelationship with and embodiment in Soviet defensive military doctrine. Realizing these tasks demands new approaches to organizing ideological-education work. The essence of these approaches is that spiritual renewal and enrichment of the life of Army and Navy collectives must create the ideological foundation of the transformations being carried out.

The dependence of results of ideological work on ideological and theoretical support of all processes occurring in the Armed Forces grows under conditions of perestroyka. Therefore military cadres master new methods of ideological influence and direct it toward shaping a high level of morale and aggressiveness and high political qualities in personnel.

It is impossible to fulfill tasks of ideological support to perestroyka in the Army and Navy without improving technical means of propaganda, without increasing the effectiveness of their use, and without fullest consideration of the real processes occurring in development of the Armed Forces and in improvement of all society. This serves as a guarantee for preventing the separation of ideological work from the life and activity of troops and from the needs and concerns of personnel.

The problem of uniting multi-ethnic military collectives and giving soldiers an inter-ethnic education comes to the fore today in this respect. Negative phenomena in ethnic relationships in the period of stagnation engendered problems retarding the development of Soviet society and degrading Armed Forces combat readiness.

Just what are the reasons for the tenacity of shortcomings in political education work done to unite multiethnic military collectives? The principal ones are insufficient perestroyka of work with people in the area of inter-ethnic education on the part of many commanders and their political deputies; their poor knowledge of Lenin's precepts on the ethnic question and of party documents on ways to resolve problems of ethnic relationships in the USSR; a low level of officer training in applying the forms and methods of inter-ethnic education in practice; an underestimation by some leaders of the danger of an ethnic coloration of nonregulation relationships among servicemen; efforts in inter-ethnic education directed at one category of personnel; and some officials' irresponsible attitude toward placement, training and education of the party and Komsomol aktiv. In overcoming these shortcomings, command and political personnel must direct efforts toward making the Soviet Army and Navy in fact a genuine school of inter-ethnic education.

Ideological support of perestroyka processes in the Army and Navy envisages a renewal of the work style and methods of leadership cadres. For long years servicemen's social interests were sacrificed for measures that were a far cry from satisfying their urgent needs. Now the situation is changing and the soldiers' awareness is improving. The serviceman must feel himself to be an individual. Only then will his abilities be revealed to the full extent, will his incentive for combat and political training be aroused and will an active position in life form in accomplishing the missions facing the unit or ship. Development of democracy and glasnost and a turn toward individual educational work with subordinates, toward ridding it of formalism, and toward sincere interest in the person's development must become the key to a change in work style of commanders and political personnel.

Speaking of democratization of Armed Forces' life, USSR Minister of Defense Army Gen D. T. Yazov noted that our Army is an inalienable element of the socialist social organism. Therefore all democratization processes also extend to this very important state organ, which is manifested in an upsurge of sociopolitical activity of servicemen, of party and Komsomol organizations, and of all democratic Army institutions.

In ideological work today special attention must be given to explaining the combination of democracy and one-man command. Army and Navy personnel must have a clear idea that democracy presumes sensible public order and demands each person's high responsibility for the assigned work sector and subordination of one's interests to those of society and the state. One-man command specifically provides for personal responsibility of leaders and the executing entities. One-man command is accomplished on a party basis and under party supervision. Every one-man commander is obligated to act within the framework of rights granted him and to implement party policy reflecting the people's fundamental interests. Democratization increases the responsibility of the officer as a party or Komsomol member to the party or Komsomol organization. Therefore reinforcement of responsibility for an assigned job is the key to perestroyka and democratization of the life of military collectives.

To increase the effectiveness of ideological work, efforts of commanders and political officers are directed at spiritual improvement, use of available forces and resources for ideological influence, perestroyka of the inner content of all its forms, and a search for new methods of shaping the personnel's high awareness. Dryness, over-organization and depersonalized "gross" educational measures do not justify themselves under conditions of glasnost. A dialogue and open, competent statements about processes occurring in international and domestic life are needed now in conversations with people. We cannot get by in this matter without exploration, initiative, and interest in educational work for the sake of the person himself and military service.

A change in the work style of Army and Navy mass media is called upon to play an important role in the task of ideological support to perestroyka in the Army and Navy. The Army and Navy mass media must become the tool of glasnost of military collectives, the tool for eradicating flaws in their life and activity, and an effective mechanism for studying public opinion and satisfying servicemen's needs.

The system of ideological support to perestroyka in the Soviet Armed Forces demands further improvement along the following directions:

—Persistently bringing political work closer to life, to the tasks being accomplished and to the personnel's interests and concerns; establishing creativeness, dialogue and discussion based on the statement of acute, burning questions of vital importance, where the result of their discussion must be well-reasoned conclusions connected with accomplishing practical tasks of perestroyka in the unit or aboard ship;

—Resolutely overcoming depersonalized educational measures, using a selective approach to a person, and shaping individual awareness and public opinion on specific questions of the military collective's life;

—Improving ideological work by party organizations, committees and buros as well as by every party member;

—Adjusting the feedback mechanism and obtaining information coming up from below; a center for studying servicemen's public opinion has been established for this purpose and is operating at the Armed Forces level under the Main Political Directorate of the Soviet Army and Navy, and the question of establishing a sociological service in the Army and Navy is being studied.

The content of ideological work demands serious changes. It is a question of bringing all subject matter of ideological-political, legal, moral and military education of servicemen into line with tasks of perestroyka in the Armed Forces and forming in servicemen the ability to think and act in a new way and the desire to achieve high results in combat and political training and strengthening military discipline. Such qualities are developed in a person by the scientific revolutionary theory of Marxism-Leninism.

A new interpretation of the works of K. Marx, F. Engels and V. I. Lenin and a detailed study of their theoretical heritage are required today with the objective of finding a key to researching modern processes and determining ways for further development and protection of the socialist state. Accomplishing these tasks is facilitated by learning and implementing the ideas and aims of our party's 27th congress, of subsequent CPSU Central Committee plenums, and of resolutions of the 19th All-Union Party Conference, which represent a model of creative development of Marxism-Leninism and the linkage of theory with the practice of improving socialism.

The ideological situation in the country and in the Armed Forces demands that every officer and every party member confidently master Marxist-Leninist dialectics, understand the action of laws of social development, see the essence of the process of improving quality parameters of Soviet defensive organizational development, and make his actions commensurable with party decisions. The defensive direction of Soviet military doctrine and the tasks of realizing it demand forming a contemporary thinking in officers and raising the political and moral culture and the social and service activeness of subordinates. A scientific understanding of the contradictions of social development in their dialectical unity serves as the key to developing such thinking.

Ideological support of perestroyka is inconceivable without a renewal of social science instruction. For now many scientific elaborations by military social scientists lag behind life and their instruction does not contain enough creative comprehension of new processes occurring in society and in the Armed Forces.

Lecture propaganda plays an important role in ideological support to perestroyka. The demands being placed on it are that now we must reveal more deeply the complexity and contradictoriness of modern processes, the essence, objectives and tasks of perestroyka, and ways of overcoming the difficulties standing in its path; we must propagandize foremost experience and effective methods of transforming various spheres of life of the Armed Forces.

Cultural-education work holds an important place in ideological support to perestroyka. Time places new demands on its organization. A growth of democracy and glasnost and people's desire for spiritual enrichment and for interesting modern forms of contact obligate political bodies to concentrate efforts on unifying their work with Army and Navy public institutions in organizing the personnel's leisure time.

Supporting perestroyka in the ideological sense is impossible without improving the work of selecting, training and educating cadres of ideological personnel and without making wide use of the mass media. Under present-day conditions the military press has to shift to a new qualitative level and elevate responsibility for objectivity of publications.

Perestroyka of ideological work in the military-patriotic education of the population and in preparation of the youth for service in the Armed Forces presently is acquiring a special place. This is dictated by the fact that with progressive movement along the path of arms reduction, pacifist sentiments are appearing in some of our teenagers, sentiments which sometimes also penetrate to the servicemen's milieu and negatively influence the process of shaping the personnel's level of morale and aggressiveness necessary for defense of the homeland. Therefore purposeful work aimed at reinforcing vigilance and raising the level of combat readiness is necessary here.

A detailed assimilation of perestroyka ideas is the most important factor in the content of ideological work. From these ideas stem the tasks of political bodies and of Army and Navy party organizations for giving ideological support to perestroyka. In accordance with demands of the Minister of Defense and Chief of the Main Political Directorate of the Soviet Army and Navy, all ideological work must be aimed at accomplishing the central task of raising the vigilance of personnel and the combat readiness of the Soviet Armed Forces.

U.S. Armed Forces

18010693b Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89 pp 7-14

[Conclusion of article by Maj Gen Yu. Omichev]

[Text] Part One of the article[1] examined the structure of supreme military command and control entities and branches of the U.S. Armed Forces. Questions concerning strategic forces, general-purpose forces, strategic troop movement forces and assets, and reserves of the U.S. Armed Forces are covered below based on data published in the American press.

According to mission-specific tasking functions and the nature of missions to be accomplished, the U.S. Armed Forces are divided into strategic forces, general-purpose forces, strategic troop movement forces and assets, and reserves.

Strategic forces consist of strategic offensive and strategic defensive forces.

Strategic offensive forces are the basis of American military power as a whole and of the nuclear potential in particular. They include three interrelated components which mutually supplement each other: intercontinental ballistic missiles [ICBM's], strategic bomber aviation, and nuclear-powered missile submarines [SSBN's]. The first two components of this triad are organizationally part of the Strategic Air Command [SAC]. SSBN's are included in submarine forces of the Atlantic and Pacific fleets.

At the present time strategic offensive forces number approximately 2,000 platforms accommodating up to 14,000 nuclear weapons with a yield of from 50 KT to 1.5 MT. The strategic offensive forces also include up to 550 tanker aircraft, around 70 strategic reconnaissance aircraft, and over 30 airborne command post aircraft.

Ground-based strategic missile forces include six ICBM wings deployed in the continental United States. According to the latest foreign press data, they are armed with 500 Minuteman III ICBM's, 450 Minuteman II's, and 50 new MX missiles equipped with a multiple reentry vehicle with ten individually targeted warheads each with a yield of 600 KT.

They are being upgraded both by modernizing equipment in the inventory and by deploying new weapon systems. In particular, full-scale development continues on a mobile version of the MX missile and on the new Midgetman mobile precision ICBM (it is a light, single-warhead missile in rail-based and ground-based versions) that can be deployed in the 1990's (50 and 500 missiles respectively).

Strategic bomber aviation, which accounts for over half of the cumulative yield of strategic nuclear weapons, consists of 22 heavy and medium bomber air wings (SAC units have a total of over 370 B-1B, B-52 and FB-111 aircraft). The main force grouping of strategic bomber aviation (over 95 percent) is deployed in the continental United States, and the other bombers are based on the island of Guam (Mariana Islands) in the Pacific.

Along with strategic aviation's primary function of participating in the delivery of nuclear strikes, the American military-political leadership uses it as a means of showing force in peacetime. To this end B-52 bombers make regular flights to areas of U.S. "vital interests" in the Near and Middle East, Western Europe, Australia and other regions. Strategic aviation (bombers, reconnaissance aircraft, tankers) is detailed to the unified Central Command and takes part in its exercises, including outside the United States and particularly in the Near East (such as Exercise Bright Star).

Strategic bomber aviation is being upgraded by outfitting B-52G and B-52H aircraft with cruise missiles and creating new types of bombers. A program for building and deploying 100 B-1B aircraft, presently armed with aerial bombs and SRAM guided missiles and in the future to be refitted for cruise missiles, was completed in 1988. In 1993 it is planned to begin producing the new advanced B-2 bombers using Stealth technology. Significant efforts are being directed at developing long-range (over 4,000 km) air-launched cruise missiles and advanced subsonic and supersonic missiles. The western military press attests that such missiles will substantially expand bomber capabilities of engaging targets in a stand-off mode.

Strategic sea-based missile forces are the least vulnerable component of the triad and are best prepared for conducting protracted nuclear warfare. They have 36 SSBN's with 640 Trident I and Poseidon C-3 missiles accommodating over 5,600 nuclear warheads. They are consolidated in four SSBN squadrons: three in the Atlantic Fleet and one in the Pacific Fleet. Around half of nuclear-powered missile submarines are constantly on combat patrol in areas ensuring the delivery of nuclear strikes from different directions against targets in the depth of USSR territory.

By the end of this century the American command plans to have 20 "Ohio"-Class SSBN's armed with new Trident II missiles, which are to become operational in 1989. The maximum range of these missiles is 11,000 km, and their multiple reentry vehicles can have 8-14 individually targeted warheads of varying yield.

The *strategic defensive forces* include systems for warning of a nuclear missile attack, for monitoring outer space, and for air defense of the North American continent.

These forces include space, airborne, and ground surveillance assets, air defense fighter-interceptors, and a far-flung network of aboveground and underground command and control facilities and centers. Organizationally the large and small units and subunits of strategic defensive forces are consolidated in principal commands of branches of the U.S. Armed Forces. Operational control of them is exercised by the unified Space Command and unified (coalition) North American Aerospace Defense Command (NORAD). Units and subunits are equipped with satellites of the IMEWS nuclear missile attack warning system, E-3 AWACS airborne early warning and control aircraft, powerful phased-array radars, semiautomatic air defense radars, the latest F-15 and F-16 air defense fighters, as well as other kinds of modern combat equipment.

The United States presently has set a course for deploying a multiechelon air defense system, creating an antisatellite weapon, and radically restructuring the entire air defense system. Wide-scale work in the area of

antimissile and antisatellite weapons based on new physical principles and capable of delivering strikes in space or from space has unfolded under the guise of defensive programs.

General-purpose forces are the most numerous and versatile component of the U.S. Armed Forces according to their tasking functions. They include ground forces, Air Force tactical aviation, and naval forces (less SSBN's) and are called upon to ensure that American imperialism's political objectives are attained in peacetime. Equipped with variously-tasked nuclear and conventional weapons and modern military equipment, the general-purpose forces have high striking power, firepower and mobility and the capability of accomplishing varied missions. They can conduct operations in land, ocean or sea theaters of war independently or together with forces of U.S. allies, show military power, and be used in crisis situations.

In accordance with the U.S. military-political leadership's aims at preparing for war in overseas territories and with demands of the strategic concept of "forward basing," significant groupings of general-purpose forces are deployed and maintained in the European, Atlantic, Pacific, and Central and South American zones. The rest of them are in the continental United States, making up a strategic reserve intended for rapidly reinforcing already established forward force groupings or for deploying new ones.

The most powerful and combat-effective grouping of all U.S. general-purpose forces abroad is stationed in the European theater of war. It is maintained in a high state of combat readiness, outfitted with modern offensive arms, and together with West German forces is the main striking force of NATO Allied Forces.

This force grouping numbers some 500,000 persons, 5,000 modern tanks, over 3,100 field artillery pieces and mortars, 1,600 army aviation aircraft and helicopters, and over 700 Air Force combat aircraft. There are over 200 combatant ships, including nine multipurpose aircraft carriers, some 70 nuclear-powered submarines and 900 Naval Aviation combat aircraft in the Mediterranean and the Atlantic.

Pershing II missiles and ground-launched cruise missiles to be reduced in accordance with the INF Treaty still remain in the American general-purpose forces in the European zone; together with F-111 and F-16 fighter-bombers and deck-based attack aircraft, they are capable of delivering nuclear strikes to the full depth of European USSR territory. In addition, several hundred nuclear warheads of submarine-launched ballistic missiles are assigned in the interests of U.S. Armed Forces in Europe.

If necessary, Pentagon plans provide for a considerable reinforcement of the Armed Forces grouping deployed in the European zone by rapid movement of forces and assets from the continental United States. Heavy weapons and military equipment for six combined-arms divisions and one Marine expeditionary brigade already have been prepositioned on the territory of a number of Western European countries to reduce movement times.

The grouping of general-purpose forces second in importance is kept in the Pacific zone. It includes around 600,000 personnel, over 1,800 combat aircraft and more than 200 combatant ships. A considerable part of these forces is deployed in the Western Pacific, including on the territories of Japan and South Korea. A special role is set aside here for naval forces, with their basis being forces of the operational Seventh Fleet. The U.S. Armed Forces grouping in the Western Pacific is to be reinforced by the operational Third Fleet as well as by movements of tactical aviation and ground forces from the United States. Variants of its reinforcement are practiced annually in the major American-South Korean Exercise Team Spirit, in which up to 200,000 persons participate.

U.S. general-purpose forces in the Indian Ocean and in the Near and Middle East area are intended for ensuring uninterrupted delivery of petroleum and petroleum products and for supporting regimes in the region suitable to the United States; they essentially are a forward grouping of the unified U.S. Armed Forces Central Command in its zone of responsibility. As a rule this grouping has up to 15 combatant ships, including one carrier with 90 combat aircraft. Depot ships with heavy weapons and stores of supplies for the Marines are constantly kept at the island of Diego Garcia (Chagos Archipelago) for a rapid buildup of the American force grouping in this region.

The grouping of general-purpose forces in the Central and South American zone has an overall strength of more than 15,000 persons and is intended for keeping the Panama Canal under U.S. control, fighting the national liberation movement, and ensuring American military presence in the region. Organizationally it is represented by the unified U.S. Armed Forces command in the Central and South American zone, the peacetime basis of which is the separate 193d Infantry Brigade stationed at Ft Clayton, Panama.

General-purpose forces in the continental United States, including mixed formations of the Army, Air Force, Navy and Marines, are a strategic reserve for reinforcing forward groupings of Armed Forces and deploying new ones. The Rapid Deployment Force [RDF], intended for direct armed intervention in the internal affairs of states under the pretext of "protecting vital American interests," also is assigned from its makeup. High mobility and the capability for fluid operations is the principal requirement for military formations included in this Force. Washington states that the primary RDF missions consist "above all in deterring and if necessary also opposing Soviet aggression and providing free world countries access to resources, above all energy resources." In reality their missions were manifested in

the bloody reprisal against Grenada (1983), the brigandage in Lebanon (1983-1984), the bandit actions against Libya (1986), the buildup of the RDF grouping in the Persian Gulf and its involvement in combat operations (1987-1988), and massive movements of RDF contingents to Honduras (March 1988) to pressure the governments of Nicaragua and Panama.

A total of up to 300,000 persons, five Army divisions, one division and one brigade of Marines, up to 1,000 combat aircraft of the Air Force and Naval Aviation, and up to 40 combatant ships including three aircraft carriers can be assigned to the RDF. The unified Central Command (headquarters at MacDill Air Force Base, Florida) was established in 1983 for exercising operational control of RDF forces and assets and for organizing and conducting operational and combat training. Its zone of responsibility includes 19 countries of the Near and Middle East and Northeast Africa.

The United States carries out a broad set of measures to build up capabilities and train general-purpose forces for wars far from its own territory that vary in intensity and in the weapons used. Numerous programs have been developed and are being implemented for this purpose such as Army-90 in the Army, Air Force-2000 in the Air Force, and the 600-Ship Navy in the Navy. Under these programs general-purpose forces are being equipped with modern precision weapon systems, their organizational structure and their command and control and logistic support entities are being upgraded, and strategic and tactical mobility is being improved. Much attention is given to modernizing theater nuclear forces. Nuclear weapons and their delivery means are undergoing qualitative changes in that their range capability and effectiveness are being improved. Work is under way to modernize Lance operational-tactical missiles and nuclear artillery (including in the direction of increasing the range of fire) and to produce and stockpile neutron weapons which, according to the estimates of American experts, are to be used for massive destruction of personnel in the course of offensive operations.

Measures for a further buildup in U.S. Army combat potential and offensive capabilities encompass a wide range of questions of the development and adoption of highly effective means of reconnaissance, surveillance and target designation and the creation of devastating systems of destruction having a varying effective range and mission-specific tasking function. An increase in striking power and firepower (especially in a follow-on forces attack) and in strategic and tactical mobility as well as an increase of large and small units balanced in makeup and combat capabilities has been defined as their principal direction of organizational development. In this connection great significance is attached to upgrading and replacing the Army tank inventory. By 1993 it is planned to deliver up to 7,500 new Abrams tanks and some 7,000 Bradley infantry fighting vehicles to the Army.

Army firepower is being improved along the line of creating more advanced weapon systems, continuing to build up the number and improve the quality of field artillery pieces and ammunition, and developing new reconnaissance-attack systems together with the Air Force for deep engagement of the enemy primarily in the course of offensive operations. In this regard special importance is attached to delivering highly effective multiple launch rocket systems (it is planned to have 500 such launchers in the U.S. Army in the first half of the 1990's). Research is under way to increase the range of fire of these rocket systems from 40 to 70 km and to create a more effective cluster warhead for the rockets.

Existing Army aviation fire support helicopters (some 1,600) are being modernized and new ones are becoming operational at increased rates. It is planned to purchase a total of almost 1,900 modern helicopters.

In the course of organizational development of Air Force tactical aviation efforts are being made to further increase its striking power, combat readiness, and capabilities of conducting lengthy combat operations far from its own bases. Special attention is given to improving its aircraft inventory; broadly introducing new kinds of aircraft weapons, especially precision weapons; developing control, communications, reconnaissance and EW systems; and improving the logistic support system.

The makeup of the tactical aviation aircraft inventory will continue to be upgraded qualitatively through annual purchases of almost 220 tactical fighters.

Pentagon objectives of achieving "decisive superiority of the United States and its allies in key ocean areas" are being realized consistently in accordance with the comprehensive program for building a 600-ship Navy. At the present time at least 200 new ships already have been included in the Navy's order of battle. "Iowa"-Class battleships have been outfitted with Tomahawk cruise missiles and Harpoon antiship missiles (a fourth ship was refitted in 1988). Construction of a fifth nuclear-powered aircraft carrier, the "Theodore Roosevelt," has concluded; construction of the next two "Chester W. Nimitz"-Class carriers is in full swing; and appropriations have been made for building another two such ships. This will ensure the simultaneous deployment of 15 combat-ready carrier striking forces as early as the beginning of the 1990's.

The outfitting of surface combatants and nuclear-powered submarines with long-range Tomahawk cruise missiles with conventional and nuclear filling is being accelerated. Strike capabilities of ship force groupings are growing considerably as vertical launchers become operational (in the future it is planned to equip at least 75 surface combatants and up to 40 SSN's with them), and it is planned to arm a total of up to 200 U.S. Navy combatant ships with Tomahawk cruise missiles before the mid-1990's.

The Naval Aviation aircraft inventory is being qualitatively upgraded and replaced by the delivery of new Hornet and Harrier combat aircraft, which are nuclear weapon platforms, and by the modification of existing deck-based attack aircraft, fighters, ASW aircraft and helicopters. Tactical air-to-surface and air-to-air aircraft armament is being improved. It is planned to arm Naval Aviation attack aircraft not only with the Harpoon antiship missile, but also with Tomahawk cruise missiles.

There is an increase in firepower of the Marines, one of the principal tools of U.S. aggression and armed intervention in the affairs of sovereign states. Assault landing equipment is being improved and more modern landing ships and air cushion vehicles are being built to improve the effectiveness of Marine operations in landing assault forces.

Strategic troop movement forces and assets are intended for moving personnel, armament and supplies from the continental United States to overseas theaters of war as well as from one theater to another. They are one of the basic means of ensuring strategic troop mobility by enabling prompt reinforcement of forward groupings of Armed Forces and organization of their uninterrupted supply. These forces and assets are part of the U.S. Air Force Military Airlift Command and the U.S. Navy Military Sealift Command.

Some 700 heavy transport aircraft (over 350 from the Air Force and 340 widebody liners of civilian airlines transferred to the Department of Defense in wartime), which are capable of meeting all requirements for moving personnel and a considerable portion of the requirements for delivering cargoes, can be used for the strategic airlifts basic to building up force groupings in forward zones. U.S. Air Force capabilities for airlifts rose from 26.9 to 44.3 million ton-miles per day through implementation of programs for modernizing strategic transport aircraft and purchasing 50 C-5B aircraft. In the assessment of American specialists, completion of these programs will permit bringing these capabilities to 51.5 million ton-miles per day by 1992 and subsequently (up to the year 2000) it is planned to increase the overall strategic transport aviation potential to 66 million ton-miles through the purchase of 220 advanced C-17 transport aircraft.

Supporting strategic movements by maritime transportation assets is the responsibility of the Military Sealift Command, made up of around 150 vessels for supporting the Navy's day-to-day activities and almost 50 that are activated during strategic troop deployment. In wartime the Military Sealift Command will be augmented by mobilization of U.S. merchant fleet vessels and a portion of the vessels of NATO countries.

In attaching primary importance to questions of strategic troop mobility, in April 1987 the U.S. military-political leadership decided to establish a Unified Transportation Command, intended for centralized direction of all forces and assets of troop and cargo movements in an emergency period and during a war.

The Pentagon poses the task of creating capabilities for simultaneously deploying necessary military contingents in Europe, Southwest Asia and the Pacific zone as an overall objective of all programs supporting troop movement and deployment.

It is planned to move the largest contingent of forces to Europe. The United States officially declares that it has pledged to NATO to deploy another six Army divisions and one Marine expeditionary brigade in countries of Western Europe in addition to the existing four divisions and two separate armored cavalry regiments within ten days from the moment the mobilization decision is made, and to move 60 air squadrons to continental airfields.

The mission assigned for Southwest Asia is to support the deployment within six weeks of a joint task force of considerable fighting strength with necessary support units and logistics for the initial period of combat operations.

American experts estimate that sea and air assets are incapable of solving the problems. Therefore reliance has been placed on comprehensive development of all forces and assets supporting strategic troop mobility, i.e., an improvement in airlift and sealift assets and establishment of depots for weapons, military equipment, and supplies in forward zones.

The prepositioning of heavy weapons and military equipment for six Army divisions basically already has been completed in Europe, and existing air assets support the movement of their personnel with light weapons within requisite time periods. In 1988 Secretary of Defense Carlucci declared that during this year the United States is to increase the quantity of weapons and military equipment prepositioned in Europe from 478,000 to 544,000 tons.

Three squadrons of special depot ships carrying heavy weapons and stores of supplies for combat operations by three Marine expeditionary brigades have been formed to improve the strategic mobility of the Marines. These squadrons are constantly deployed in the East Atlantic, Indian Ocean and Western Pacific. Special vessels are being built for these same purposes which allow unloading combat equipment and cargoes over the beach.

U.S. Armed Forces reserves are military formations established in peacetime as well as contingents of personnel who have been trained or are undergoing training and are intended for rapid Armed Forces mobilization and deployment if necessary. They are divided by mobilization time periods into first, second and third order reserves.

Units of the National Guard and Reserves of branches of the Armed Forces which form the so-called organized reserve with an overall strength of up to 1,150,000 persons make up the basis of the first-order reserve. Large and small units and subunits of the organized reserve are manned by personnel who serve in them on a permanent basis (permanently assigned personnel), as well as by reservists from among persons having military training who work in civilian organizations and live in the area where the unit to which they are assigned is stationed (unit-assigned personnel).

Unit-assigned personnel are brought in weekly (on days off) for four-hour classes in combat training as part of their subunit. A 15-day to 30-day training camp is held with reservists once a year during which combat training activities are worked as part of subunits and units.

In addition, the first-order reserve includes trained reservists who are intended for replacing losses in the initial period of war.

The second-order reserve includes militarily trained personnel who have served in the regular forces or the organized reserve for at least six years and who are on the rolls until age 60.

The third-order reserve basically is made up of persons 45-60 years of age who have served in the regular forces and organized reserve for at least 20 years.

Second-order and third-order reservists are not brought in for combat training in peacetime.

The National Guard represents combat-ready large and small units and subunits of the Army and Air Force which are manned by unit-assigned personnel, equipped with weapons and military equipment, and organized according to the regular troop structure. In peacetime they are administratively subordinate to the governors of states on whose territory they are stationed.

The Army National Guard numbers some 570,000 persons, ten divisions, 18 separate brigades and four armored cavalry regiments, and the Air National Guard includes 24 variously tasked air wings with over 1,600 aircraft.

The branch reserves of the Armed Forces are subordinate to their own departments and include large and small reserve units and subunits organized under regular troop TOE's as well as individual combat-ready reservists. They are intended for bringing regular formations up to wartime TOE's primarily by including combat support and combat service support units and subunits in their makeup and setting up a mobilization training facility for training personnel. The reserves number up to 580,000 persons, three separate brigades, 27 separate battalions, over 230 other Army combat support and combat service support units and subunits, three air force headquarters, 19 air wings, up to 500 Air Force aircraft, a Marine division, over 80 ships and auxiliary vessels, and more than 650 naval aircraft.

Plans for organizational development of the National Guard and Reserve of branches of the Armed Forces being implemented in accordance with the "unified forces" concept (which provides for achieving a level of combat readiness and combat effectiveness identical with regular forces) outline a yearly increase of 3-5 percent of personnel strength; delivery of modern weapon systems (M1A1 Abrams tanks, M2 and M3 Bradley infantry fighting vehicles and combat reconnaissance vehicles, F-15, F-16 and F/A-18 combat aircraft of new modifications, AH-64 Apache combat helicopters and others) to the troops; and intensification of operational and combat training.

A *global operational command and control system* has been established for centralized direction of Armed Forces both in peace and wartime. It includes over 130 supreme state and military entities involved in directing the country and its Armed Forces. In its structure, makeup and technical outfitting this system is called upon to provide reliable and continuous command and control of Armed Forces in a protracted war, including with the massive use of strategic nuclear weapons.

The supreme military entities of the system are the primary and alternate command centers and the airborne command post of the JCS. Its functioning is supported by the Defense Department joint communications system and by a number of special communications systems.

On the whole, U.S. military-political circles believe that considering their organizational development plans, the Armed Forces established in the country ensure that objectives of the policy conducted by the administration at the present time and in the foreseeable future are attained.

Footnotes

1. For the beginning of the article see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1989, pp 7-10—Ed.

Military-Political Situation in the Asiatic-Pacific Region

18010693c Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 14-19

[Article by Col G. Melnikov, candidate of historical sciences]

[Text] The Asiatic-Pacific region represents a gigantic and most rapidly developing part of the world with a population of more than three billion. Many problems

accordingly arise demanding comprehension, normalization of relationships among the region's states, and their introduction to the channel of coordination and cooperation. In a speech in Vladivostok Comrade M. S. Gorbachev advanced constructive proposals for strengthening pan-Asian security and reducing the level of military confrontation, proposals which were logically developed in a speech at Krasnoyarsk in the fall of 1988. Questions of untying the knots of conflict and confrontation and stopping the region's militarization are in the foreground. If these questions are not faced, the Asiatic-Pacific region can turn into a source of dangerous growth of regional and worldwide contradictions.

Relaxation of tension, a reduction in arms, and establishment of civilized, good-neighbor relations among countries are the key to normalizing the situation in Asia and the Pacific basin, as is the case everywhere in the world. The Soviet leadership is making specific proposals based on new political thinking in an attempt to advance the matter of security in the Asiatic-Pacific region. They include the following:

—The USSR will not increase the number of any nuclear weapons in the Asiatic-Pacific region, nor has it done so for some time, and it calls upon the United States and other nuclear powers not to station additional weapons of this sort here;

—The Soviet Union invites the region's principal naval states for consultations on nonproliferation of naval forces;

—Our country proposes to discuss on a multilateral basis the question of reducing military confrontation in areas where coasts of the USSR, PRC, Japan, North Korea and South Korea converge with the objective of a freeze and commensurate reduction in levels of naval and air forces and a limitation of their activities;

—If the United States will undertake to eliminate military bases in the Philippines the Soviet Union will be ready to give up the naval logistic support facility at Cam Ranh Bay by agreement with the government of the SRV;

—It is proposed to jointly work out measures to prevent incidents on the high seas and in the superjacent air space in the interests of security of the region's sea and air lines of communication;

—Hold an international conference no later than 1990 on turning the Indian Ocean into a peace zone;

—Discuss at any level and in any makeup the question of establishing a mechanism of talks for considering our own and any other proposals relating to security of the Asiatic-Pacific region.

Realistically thinking politicians assessed these peace initiatives positively, but representatives of reactionary imperialist circles continue to express doubt about the USSR's sincerity, using this to mask their own aggressive objectives. It is common knowledge that recent years have been characterized by increased attention to the Asiatic-Pacific region on their part. The main reason for the interest continues to be considerations of strengthening opposition to the world of socialism and undermining the trend toward relaxation of world tension, especially today when the Geneva agreements on Afghanistan have been signed, progress has been achieved in solving the Cambodian problem, the Iran-Iraq war has ended, and some signs of a relaxation of tension in other parts of the planet have been seen.

The Geneva agreements on Afghanistan exerted a beneficial effect on processes in the Asiatic-Pacific region and permitted its countries to take a more objective approach to assessing our policy. Afghanistan now is at an important historical stage. Despite systematic violations of these agreements by Pakistan with direct U.S. complicity, they represent the main direction for settling the situation in the country providing for achievement of an understanding among countries involved in the conflict and creating a foundation for national reconciliation and formation of a coalition government. The agreements also are contributing to a search for ways to settle other regional conflicts and to reduce tension in the region as a whole.

But reactionary imperialist circles proceed from the assumption that the United States and its allies are capable of ensuring substantial military superiority over the Soviet Union in Asia and the Pacific basin and taking control of the situation's development. The U.S. attempt to strengthen its influence here pursues global objectives, the primary one being to turn the territories of a number of countries of the Far and Middle East, South Asia, and water areas of the Pacific and Indian oceans into a Pentagon springboard for creating a threat to the Soviet Union from the East and South. The thesis that "vital strategic, economic and diplomatic interests of the United States converge" in this region is advanced for the purpose of substantiating these schemes and practical measures. This thesis is to be implemented by accomplishing the following tasks: opposing a growth in the Soviet Union's influence, strengthening regimes subservient to Washington, and guaranteeing the West's free access to local strategic raw materials, and to Persian Gulf oil above all.

Behind these tasks it is easy to perceive the desire to prove to the world community the "vital necessity" of U.S. military presence in the region and justify any military adventures. Such a policy fully conforms to the American doctrine of "neoglobalism," under the guise of which attempts are made to reinforce pressure on progressive forces in the region.

Schemes for further stepping up exploitation of the region's natural resources also exert great influence on U.S. policy in the Asiatic-Pacific region. In the 1980's certain countries in the region turned into suppliers of very important kinds of raw material for American industry. Eight of eleven kinds of mineral products imported by the United States come from states of Asia and the Pacific basin. Among them are titanium (97 percent of the volume of American imports of this metal), tin (82 percent), mica (80 percent), tantalum (42 percent) and natural rubber (88 percent).

The high, stable rates of economic development of the region's principal capitalist countries and their solvency attract American monopolies. Because of this there has been a rapid growth in volume of private U.S. investments, which in 1986 reached $33 billion, and foreign economic ties are expanding. In 1986 the scale of trade with region countries exceeded the level of U.S. trade with West European states by 35 percent and comprised $187 billion.

The center of world economic development is shifting into the Pacific region, which is a component part of the Asiatic-Pacific region. Today Pacific Ocean states already are characterized by the most rapid growth rates of the economy and of scientific-technical progress. This concerns not only Japan and the U.S. west coast, but also South Korea, Taiwan, Singapore and Hong Kong. Thailand, Malaysia and Indonesia are developing rapidly.

Reactionary circles perceive the positive socioeconomic processes occurring in the Asiatic-Pacific region as a threat to the dominant position of American capital. This was noted in a recent report by the U.S. Congressional Research Service. The growth of national self-awareness of the region's peoples and their resolve to ensure their own sovereignty causes special concern for a number of American politicians. Intending to strengthen U.S. positions and retard the development of undesirable trends in the Asiatic-Pacific region, they have noticeably stepped up their efforts here, placing emphasis on supporting and maintaining dominant positions.

Representatives of the American administration and especially Pentagon leaders come out with statements about the growing Soviet threat in the Asiatic-Pacific region in substantiating their actions of comprehensively building up militarist preparations and in concealing the desire for military supremacy. They use various kinds of juggling and conjecture, crudely distort the essence of USSR foreign policy, and pervert the strictly defensive nature of our military doctrine.

As a matter of fact, even the American press admits that in their makeup, infrastructure and training it is specifically the U.S. Armed Forces that have a clear-cut offensive character. For example, the grouping of U.S. Armed Forces in the Pacific zone, and above all in its western part near USSR territory, numbers up to 150,000 persons, over 1,200 aircraft and around 50 combatant ships. Seven aircraft carriers with over 600 aircraft aboard, of which more than 250 are nuclear weapon platforms, comprise the basis of the American Pacific Fleet's striking power. Aircraft based on the carriers have the capability of delivering nuclear strikes 1,000 km deep in Soviet territory. Constitution of the 17th SSBN Squadron, which has eight "Ohio"-Class submarines, has been completed and the Navy's fleet forces are being upgraded and replaced within the framework of the program for upgrading sea-based strategic offensive forces.

The U.S. Navy force grouping in the Northwestern Pacific practices missions aimed at blockading the Soviet Pacific Fleet in the Sea of Japan, Sea of Okhotsk and Bering Sea and subsequently destroying it in case of military operations. Operational training of American forces in the immediate proximity of the Soviet Far East coast is being stepped up considerably.

In accordance with the "forward sea frontiers" concept the American command extended the Third Fleet "zone of responsibility" in 1987 to areas adjoining the Kamchatka Peninsula. Carriers, battleships and missile ships interworking with strategic aviation have begun to be sent there periodically.

Not limiting itself to large-scale exercises near USSR territory, the United States is undertaking direct provocations. An example of this is the violation of the Soviet Union's territorial waters off the shores of Kamchatka in May 1987 by the nuclear-powered guided missile cruiser "Arkansas".

The basis of activities in the Asiatic-Pacific region by Washington and its allies is the "balanced deterrence" concept, according to which the United States, Western Europe and Japan must coordinate their operations so as to make the Soviet Union divide forces in three directions: west, east and south.

One objective of U.S. reactionary militaristic circles in the region is to move the Armed Forces up as closely as possible to the borders of the Soviet Union and other socialist countries. The territories of Japan and South Korea, where 47,000 and 42,000 American servicemen respectively are located, are used above all for this purpose. The principal element of Pentagon strategy in the Asiatic-Pacific region is "nuclear deterrence." Ships and submarines of the American Seventh Fleet have been in the process of being outfitted with Tomahawk cruise missiles since 1984. Air-launched cruise missiles have been installed in strategic B-52 bombers stationed on the island of Guam. There are 48 F-16 fighter-bombers located at Misawa Air Base in Japan and there are just as many in South Korea.

These and other weapons of mass destruction are intended above all for delivering strikes against Soviet territory, as attested by the nature of regularly conducted

American troop exercises, which more than once have developed into a rehearsal for delivering nuclear strikes. In particular, during maneuvers on the island of Hokkaido in late 1987, F-16 fighter-bombers stationed in Japan practiced the tactic of delivering massive bombing strikes near Soviet borders. An exercise in the Bering Sea also was of a no less provocative nature. The primary mission of the American Navy force grouping taking part in it was to demonstrate a buildup of U.S. military power in the North Pacific.

A special place is set aside for Japan in plans for military preparations in Asia. The Pentagon uses 120 military bases and installations situated on Japanese territory. By their structure, nature of armament, and missions the Japanese Armed Forces, officially called the Self-Defense Forces, long ago turned into a modern, powerful regular Army numbering 270,000 persons. Of these almost half are officers or NCO's. The Self-Defense Forces' inventory includes over 1,100 tanks, more than 320 combat aircraft, 54 ships of destroyer and frigate types and 14 submarines. These are rather impressive figures for a country whose constitution condemns war and possession of a military potential. Despite this, the United States is dissatisfied over the fact that in its opinion Japan is playing the role of a passive ally and so it insists on the country's further militarization.

Sharing the aspirations of U.S. militarist circles, Japan's reactionary forces are intensively building up military expenditures, which increased by an average of 5 percent annually throughout the 1980's. Japanese experts believe that the country can move into third place in the world in military expenditures in the 1990's.

Military-technical ties, manifested in particular in the outfitting of Japanese Armed Forces with American weapons, play an important role in the system of Japanese-American relations. For example, the country's Navy has some 70 submarines, combatant ships and aircraft equipped with American Harpoon antiship missiles. By 1990 the number of such platforms is to be brought to 120. In October 1987 the secretaries and ministers of the U.S. and Japanese military departments concluded an agreement on joint development of a new FSX tactical fighter based on the American F-16. Since 1980 Japan has been taking an immediate part in naval Rimpac maneuvers. The United States, Canada, Australia and Great Britain are participants in addition to Japan. According to foreign press data, in 1987 Japanese Army and Navy forces were actively included in joint exercises—command and staff (3), army (4), air force (7) and navy (1).

Japan's close and distant neighbors are troubled by its persistent buildup of military potential within the scope of a "division of responsibility" with the United States. By including Tokyo in its militaristic plans, Washington is counting on easing the burden of its own military expenditures on the one hand and weakening the onslaught of a strong competitor in international markets on the other hand. In the opinion of a number of American experts, drawing Japan into the arms race also will permit using its powerful S&T potential for U.S. attainment of military supremacy over the USSR in the region.

The course toward an expansion of militarist preparations and cooperation with the United States finds rather broad support in Japan's military-political leadership. Back in 1981 the Japanese government declared readiness to assume responsibility for "defense" of ocean lines of communication at a distance of up to 1,000 nm from its shores. In January 1983 Nakasone, then prime minister, declared the readiness of Japanese Armed Forces to blockade international straits—Korean, Tsugaru, and La Perouse—in case of "extraordinary circumstances."

An important role is given South Korea in the strategy of Washington's militant circles in the Asiatic-Pacific region. These circles are drawn above all by the possibility of using South Korean territory as a springboard for military preparations aimed at socialist states. As the British newspaper FINANCIAL TIMES noted, "For the United States South Korea is a valuable albeit costly and unpopular (in America) bulwark of anticommunism in Asia."

At the present time the United States has 40 military bases and installations on South Korean territory. Also taken into account is the readiness of the South Korean leadership to take an active part in a new alliance (United States-Japan-South Korea). Pentagon generals are drawn not only by the strategic position, but also by the considerable military potential of this state. The South Korean Armed Forces include over 20 divisions. In accordance with a "security treaty," they are subordinate to a joint American-South Korean command headed by an American general.

A complicated situation is preserved on the Korean Peninsula, although here too signs of an emerging dialogue between North and South have begun to be seen.

Washington also gives fixed attention to ASEAN countries. According to Pentagon war plans, Indonesia, the Philippines, Thailand, Malaysia and Singapore are to become supply terminals during a movement of American troops from the United States to Persian Gulf and Indian Ocean areas. The possibility of American forces conducting operations in Southeast Asia as well is not precluded. Therefore steps are being taken to include ASEAN countries in a system of military preparations, including by selling them arms. During the period 1981-1985 the volume of arms sales in states of the Asiatic-Pacific region reached three billion dollars. It is assumed that this will double by 1990. American military bases are situated on the territory of the Philippines, with the largest being Clark Air Base and Subic Bay Naval Base.

The latter services up to 70 American ships monthly and has depots. Washington also is trying to establish intermediate ship refueling points, military depots and bases in other ASEAN countries.

The process of expanding American-Pakistani military and political cooperation is having a destabilizing effect on the military-political situation in this region. Pakistan is one of the primary recipients of American military-economic aid. Islamabad regularly sent requests to Washington for new lots of modern arms: aircraft, field artillery pieces, multiple-launch rocket systems, APC's, portable SAM systems, guided missiles and so on. An understanding was reached between the United States and Pakistan about use of Pakistani ports and airfields by American combatant ships and aircraft and about modernizing a number of naval bases, ports and airfields on the Makran coast of the Arabian Sea as well as an air defense system in areas bordering on Afghanistan with the participation of U.S. specialists. U.S. desire to legalize American military presence in the Middle East is of special concern in countries neighboring on Pakistan.

The military-political situation in India remains tense. Assurance of the country's stable economic development, a rise in the population's standard of living, and elimination of reasons for inter-ethnic enmity and religious-communal and caste contradictions—all these complex problems require resolution. A base continues to exist in the states of Punjab and of Jammu and Kashmir as well as in India's North East areas for operations of nationalist and separatist forces such as Singh extremist groupings in Punjab, which, with support from abroad (above all from Pakistan), continue to struggle to establish an independent state of Sikhs, Halistan.

These problems influence the situation not only in India itself, but also in South Asia as a whole. Meanwhile India's international authority as the leader of the Nonaligned Movement is an important stabilizing factor of the situation in South Asia.

Soviet-Indian relations have progressed over the last three years, which was reflected in the New Delhi Declaration, where the concept of peaceful coexistence was supplemented by ideas of a total rejection of the use of force among all states. Adherence to this declaration not only was affirmed during Comrade M. S. Gorbachev's visit to India in November 1988, but new steps also were taken to preserve the line toward developing cooperation between the two states within the context of an understanding of their special responsibility for the world situation and for the security of peoples.

The military-political situation in Bangladesh and Sri Lanka remains rather complicated. Both states are experiencing considerable economic hardships, which the West is attempting to use to reinforce influence on the Bangladesh and Sri Lankan governments by granting economic and military aid. The problem of relations among the principal nationalities of Sri Lanka—Sinhalese and Tamils—remains unresolved in this state despite India's mediation in stopping combat operations between government troops and combat formations of Tamil extremists. American military presence in the Indian Ocean zone, activities of the unified Central Command of U.S. Armed Forces here, and the arms race unleashed by the United States in this part of the world have a negative effect on the military-political situation in the Middle East and in South Asia. An American naval force grouping is practically constantly in the ocean waters. A store of weapons, military equipment and ammunition for a contingent of American forces planned for use in case a "threat" to American interests arises in the region is kept in full readiness aboard depot ships deployed near Diego Garcia Atoll. Strategic aircraft, airborne early warning and control aircraft, and land-based patrol aircraft systematically fly over Indian Ocean waters. All this is done to secure U.S. military positions and expand Washington's capabilities of exerting influence on the situation in the region.

Not wishing to take part in militarist actions, some countries of the Asiatic-Pacific region have taken the path of establishing nuclear-weapon-free zones. A major step in this direction was conclusion of the Rarotonga Treaty by 13 states of the South Pacific in 1985.

Development of the military-political situation in the Asiatic-Pacific region persuasively shows that the primary obstacle in the path of its normalization consists of militarist aspirations of leading capitalist states. The peaceful policy of the Soviet Union and other socialist countries aimed at a joint search for constructive solutions in the sphere of international security is in fundamental contrast to these actions.

Ground Forces of NATO countries in the Central European Sector

18010693d Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 21-26

[Conclusion of article by Col V. Kholmov]

[Text] Part One of the article[1] examined the overall characteristics of the Central European sector, fighting strength of the grouping of theater ground forces, and the organization and armament of large units. The state of combat readiness and capabilities of the NATO command to reinforce theater ground forces as well as the direction of operational and combat training and manpower acquisition are examined below.

State of combat readiness. Under existing requirements, large ground units intended for transfer to coalition command authorities must be manned by trained personnel and outfitted with weapons and military equipment in accordance with the combat readiness categories established for them. For example, in divisions, for which the highest category has been established, it is proposed having some 90 percent of personnel and 100 percent of weapons even under peacetime conditions. American ground forces in the theater fully meet these requirements. West German divisions have 85-90 percent and corps units have 60 percent of their personnel. Ground force groupings in the Central European sector have large and small reduced-strength (reserve) units, each of which has up to ten percent of the personnel, while weapons and equipment are stored at depots. Judging from western press materials, such large and small units exist in Great Britain, the Netherlands (one division and one brigade), the FRG (brigades and regiments of territorial forces, with the exception of six brigades), and Belgium (two brigades). It is planned to bring them up to strength from a call-up of reservists with the beginning of mobilization.

Reinforcement of ground forces. In the assessment of foreign specialists, the ground force grouping which has been established and which is in a high state of combat readiness in the Central European sector can be considerably reinforced in short time periods by bringing existing large units up to strength, activating new ones and moving reinforcing troops to the theater. Questions of mobilization readiness are worked out during exercises conducted within the scope of NATO and under national plans.

The foreign press notes that it is planned to *bring large and small permanent-readiness units up to strength* of wartime TOE's in the FRG, Dutch and Belgian ground forces using reservists. In accordance with national mobilization systems of the bloc's West European countries, servicemen who have served their time are transferred to the reserve (in the FRG, for example, this is a "permanent readiness" reserve) but remain assigned to units (for one year in the FRG and for six months in the Netherlands), where they perform active duty. They are to arrive in their subunits with the declaration of mobilization. On the whole, as the foreign press emphasizes, the numerical strength of large and small units can be increased by 1.5-2 times from a call-up of reservists. For example, the Bundeswehr I Army Corps, which in peacetime numbers some 100,000 persons, will have approximately 140,000, II Army Corps will have 120,000, and III Army Corps 110,000.

Plans for reinforcing the existing ground force grouping in the Central European sector set aside an important role for so-called *reserve components*, including territorial forces (FRG, the Netherlands and Great Britain) and territorial defense forces (Belgium). In the United States they are represented by the organized reserve, consisting of the Army National Guard and the Army Reserve.

The FRG territorial forces are a component part of the Bundeswehr ground forces. Organizationally they are consolidated in three commands: Schleswig-Holstein, North and South. The boundaries of the latter two commands coincide in peacetime with "zones of responsibility" of the corresponding army groups (the first with NORTHAG and the second with CENTAG). Within the boundaries of this zone are 10 Home Defense brigades and 13 regiments as well as engineer, medical, transportation and other subunits. They number approximately 50,000 persons (up to 500,000 after mobilization), some 700 tanks, over 600 field artillery pieces and more than 600 antitank weapons, half of which are ATGM launchers. It is proposed to establish new elements on the basis of units and subunits of territorial forces.

The structure of Dutch territorial forces corresponds to the country's military-administrative division. Each year over 40,000 servicemen train in their training centers. The overall numerical strength of territorial forces can increase to 70,000 persons with the beginning of mobilization. It is planned to deploy two infantry brigades and three separate infantry battalions as well as support units and subunits from them.

Elements of Belgium's territorial defense forces (internal forces, numbering some 20,000 in peacetime) are maintained at reduced-strength levels and weapons are stored at depots. In wartime their numerical strength can be brought to 80,000 persons. They have separate infantry battalions and regiments, a commando parachute regiment and other subunits.

Great Britain's territorial forces include separate reduced-strength units and subunits. Over 75 percent are intended for reinforcing British troops which are part of the NATO Allied Forces. They include a mechanized infantry division, 13 separate brigades, 12 regiments and 40 mechanized infantry battalions.

The primary mission of territorial forces in wartime is to support the forward movement and deployment of ground force groupings in the Central European sector in corresponding "zones of responsibility": FRG territorial commands in the forward and rear areas of the combat zone, and those of the Netherlands and Belgium in the communications zone.

A special role is set aside for Bundeswehr territorial forces, called upon to support the arrival of American reinforcements being moved onto their country's territory. To this end "support commands" have been formed within these territorial forces, with their subunits and units to be brought up to full manning levels in case of a crisis situation and for a period of exercises. For example, in one NATO Allied Forces Autumn Forge fall exercise the "support commands" supported the arrival and movement to operational tasking areas of large American units moved to the FRG over a 48-hour period.

The *movement of reinforcements* from the United States, Great Britain and Canada is regarded as a no less important element in reinforcing the ground force grouping in the Central European sector. It is accomplished under appropriate plans, provisions of which are updated regularly during exercises and other operational activities.

Under the American Reforger (Redeployment of Forces to Germany) plan, subunits of so-called "dual-based" large and small units are to be moved from the continental United States to the Central European sector: 1st, 4th and 5th mechanized divisions, 1st Cavalry (Armored) Division, 2d Armored Division, 3d Separate Armored Cavalry Regiment, as well as the 9th Motorized (previously Infantry) Division, 82d Airborne Division and 101st Air Assault Division. In addition, Army National Guard subunits also may be moved to the FRG. The movement of troops (17,000-35,000 persons) is carried out during Exercise Reforger, held annually within the framework of NATO's fall maneuvers.

To reinforce the British force grouping in the Central European sector it is planned to move the 2d Mechanized Infantry Division, 19th Separate Mechanized Infantry Brigade and 5th Separate Airborne Brigade as well as personnel intended for bringing divisions in the FRG up to strength. In the assessment of western military specialists, the numerical strength of the British army corps can almost triple (from 50,000-55,000 to 140,000 persons) as a result of the reinforcement. Beginning in 1989 it is planned to move the 24th Airmobile Brigade for reinforcing the British corps and NORTHAG.

When the situation is aggravated, it is planned to reinforce Canadian troops by a mechanized infantry brigade additionally moved from that country and to deploy a division based on this brigade and on the brigade existing in the theater.

Armament for large units whose personnel are on the territories of their own countries is prepositioned in the theater to shorten time periods for moving reinforcements. The most wide-scale work in this regard has been done by the United States. For example, under the POMCUS program (prepositioning of sets of weapons and military equipment) weapons and military equipment have been prepositioned in the FRG (near the cities of Germersheim, Karlsruhe, Kaiserslautern, Mannheim and Pirmasens), the Netherlands and Belgium for six "dual-based" divisions to be moved from the United States. Combat readiness of equipment stored at the depots is 90-95 percent. Based on exercise experience, it takes an average of up to four hours to draw and demothball weapons for a mechanized infantry battalion.

In the opinion of American military specialists, prepositioning permits considerably shortening the time periods for troop movement. In particular, in a Bundeswehr corps exercise held under the codename Starke Wehr the personnel of a reinforced battalion were moved from the United States to the FRG in ten hours, and in 20 hours this battalion had been moved to the designated area and had been "committed." Exercise experience shows that the presence of depot weapon reserves on territories of the FRG and other NATO countries permits completing the movement of six divisions and placing them in full combat readiness in operational tasking areas in 7-8 days. It is proposed to activate the III Army Corps on the basis of three divisions—4th Mechanized Division, 1st Armored Cavalry Division and 2d Armored Division—and other separate units to be moved, and to transfer this corps to NORTHAG.

As attested by operational and combat training activities, it is planned to airlift and sealift reinforcing troops to the Central European theater, and within the theater they will be moved as a rule by a combination method. Foreign military specialists assume that in crisis situations, when the time factor moves into first place, moving troops in aircraft of military transport aviation, which are capable of ensuring the initial deployment of necessary contingents of troop elements in the shortest possible time periods, will be most effective. As a rule, this is done in stages. The United States uses C-5 Galaxy and C-141 Starlifter aircraft of military transport aviation for this purpose. In Exercise Reforger advance groups for drawing materiel at the depots arrive from the United States initially at West European airfields of Ramstein and Rhein-Main in the FRG, Schiphol in the Netherlands and Brussels in Belgium. Then the main personnel of the large and small units being moved also are delivered by aircraft. From airfields they are moved by motor transport to concentration areas of the combat equipment moved from depots. British troops are moved by C-130 Hercules aircraft of the Royal Air Force military transport aviation. Guetersloh Air Base in the FRG ordinarily is used to receive them.

It is planned to extensively activate widebody aircraft of civilian airlines for airlifting troops and cargoes. In the assessment of American experts, the country's 34 airlines are capable of taking on up to half of all military cargo airlifts. The British leadership also is examining questions of using civilian aircraft for military movements. For example, in 1984 35,000 of 57,000 British servicemen were delivered to FRG territory from Great Britain by passenger aircraft of British airlines to take part in corps exercise Spear Point.

Sea transport vessels (ferries) chiefly carry heavy materiel and supplies. The time for sealifting (including loading and unloading) usually takes up to 18 days from the United States and several hours from Great Britain. During various exercises transports usually arrive in ports of the Netherlands (Rotterdam and Antwerpen), Belgium (Ghent) and the FRG (one transport takes an average of up to 7 hours to unload). It is planned to use

rail transportation and C-130 Hercules military transport aircraft of the U.S. and Canadian air forces and C-160 Transall aircraft of the FRG Air Force for subsequent movement of the delivered cargoes and personnel within the theater. Arriving wheeled equipment usually moves up from unloading points under its own power as part of columns that are formed (20-40 vehicles each).

Foreign specialists also take French ground forces into account with respect to possible reinforcement of force groupings in the theater. According to western press data, they number 15 divisions, some 1,500 tanks, 1,500 field artillery pieces and mortars, and over 500 army aviation helicopters. In recent years France has been cooperating more closely with NATO countries in the military area and it takes plans of the theater high command into account and coordinates its own national programs with them. For example, in 1987 the French command assigned the largest contingent of troops for participation in bloc-wide measures. Just in the joint Franco-West German field training exercise Kecker Spatz, conducted within the framework of the Autumn Forge maneuvers, three of the five divisions taking part in it (with an overall strength of up to 20,000 persons) were French from the French Rapid Action Force. In addition, in that same year the French Army conducted some 50 other operational and combat training measures on a varying scale together with large units of other NATO countries. A government agreement was signed between France and the FRG in 1988 on forming a mixed Franco-West German brigade for operating on FRG territory in the "zone of responsibility" of the South territorial command.

Direction of operational and combat training. The foreign press notes that under day-to-day peacetime conditions activities of coalition entities of the NATO Allied Forces in the Central European sector are aimed at preparing staffs and troops for conducting active operations to defeat the probable enemy. Views of the bloc leadership on the nature of modern warfare and on the forms and methods of employing armed forces in it in accordance with the NATO-wide concept of "follow-on forces attack," officially adopted in 1984 and known in the press as the "Rogers Plan," are made the basis of the operational and combat training measures being taken.

The intensity of operational and combat training varies during the year. In its first half primary emphasis usually is placed on training command personnel and staffs, while the latter half usually is characterized by the conduct of bloc-wide and national exercises. Their peak is a series of Autumn Forge fall maneuvers, consolidating various exercises with a unified operational-tactical background and concept.

The NATO command conducts its numerous exercises for propaganda purposes according to the following scenario in an attempt to emphasize the defensive nature of the doctrine. In the first phase the Blue forces, which are taken to mean NATO forces, are forced to repel the aggression of the probable enemy and to conduct delaying combat operations by peacetime force groupings. Then, taking advantage of arriving reserves, an opportunity is created for the Blue forces to stop the enemy who has penetrated, launch a counteroffensive and restore the position along the state border. The operational-tactical standards used by large army units in conducting defensive and offensive operations are given in the table.

Basic Operational-Tactical Standards

	Width of Defense Zone, km		Offensive		
				Mission Depth, km	
Country	Laterally	In Depth	Zone Width, km	Immediate	Subsequent
Divisions					
USA	25-40	50-60	20-30	30	35-40
FRG	20-40	40-60	20-30	20-30	40-60
UK	30-35	30	20-25	15-20	35-40
Army Corps					
USA	60-80	100-110	40-80	35-40	100-150
FRG	40-80	100-140	50-70	40-60	100-150
UK	60-70	70-90	50-60	35-40	70-90

The landing of tactical airborne assault forces to a depth of up to 70 km, insertion of reconnaissance and raiding parties in the "enemy" rear, and electronic warfare are practiced; questions of employing new kinds of weapons and military equipment becoming operational are worked out and studied; and organizational structures of troop elements are officially accepted during the exercises.

According to foreign press data the greatest intensity of field training exercises is noted on FRG territory. Three to four corps exercises, 10 division exercises, 80 exercises by brigades and equivalent, and some 5,000 battalion-company level exercises are held here each year. Based on the makeup of participants, corps and essentially all division exercises go beyond the bounds of purely national exercises. Units and subunits of other

countries in the theater are involved in conducting them and staffs of NATO allied command authorities are involved in working out, organizing and coordinating the operations. A characteristic feature of the exercises is the actual deployment of powerful attack forces in the immediate vicinity of boundaries of the GDR and CSSR, including up to 60-70 percent of all large army units stationed in the theater in peacetime. For example, the headquarters and units of 11-14 divisions usually move out to field areas and deploy during the active phase of Exercise Autumn Forge, with their transfer to operational subordination of coalition command authorities of the NATO Allied Forces.

In accordance with the document of the Stockholm Conference on Confidence-Building Measures and Security and Disarmament in Europe adopted in September 1986, there is a provision for preliminary notification of the beginning of military activities. With respect to ground forces, military activity is subject to notification if 13,000 persons take part or 300 tanks are in action in it. In those cases where the numerical strength of troops involved reaches or exceeds 17,000 the country on whose territory these activities are being conducted will invite observers from all states which signed this document. At the same time, states are granted the right to conduct an inspection in areas giving rise to doubt. Document provisions entered into force in 1987.

Manpower acquisition of ground forces is accomplished in accordance with national laws of each country. Large and small units of American, British and Canadian troops stationed on FRG territory are fully manned by servicemen under contract for a period of from three or more years. The proportion of volunteer servicemen in the Belgian Army is around 70 percent, in the Dutch Army 60 percent and in the FRG Army 50 percent. A special role is set aside for NCO's, who represent a significant layer in the army. For example, in the Bundeswehr they comprise around 30 percent and in large American units over 60 percent. The system of selecting sergeants and NCO's is designed to preclude persons suspected of disloyalty to existing political systems in the countries from getting in. For example, military counterintelligence, the FBI, the military police and so on in the United States take part in checking the political reliability of junior command personnel being sent to serve in Europe.

Most of the officers are representatives of privileged layers of the population. They are conductors of policy of their countries' ruling circles. Officer training for NATO allied staffs is accomplished both in national educational institutions and at the NATO Defense College (Rome, Italy).

Brainwashing of servicemen is given a significant place throughout all their service. In the opinion of western ideologues, the widely conducted brainwashing should prepare personnel for the fact that their principal enemy is the Soviet Union and other Warsaw Pact countries and that only the North Atlantic Alliance is capable of deterring "the spread of the communist threat to western democracy."

In the assessment of western specialists, a powerful, well-equipped ground force grouping has been established in Central Europe that is kept in a high state of combat readiness. Its strength can grow considerably in a short period of time. The development and upgrading of allied armed forces in the Central European theater attest to reinforced aggressiveness of the bloc leadership's intentions and purposeful training of troops for initiating war against Warsaw Pact countries. In the face of the growing military danger, Warsaw Pact member states favor talks for reducing armed forces and conventional arms in Europe from the Atlantic to the Urals, and they express a readiness for a simultaneous disbandment of opposing military alliances. The Declaration on Talks for Reducing Armed Forces and Conventional Arms in Europe adopted at a conference of the Political Consultative Committee of Warsaw Pact member states (July 1988) emphasizes: "The allied states are convinced that the priority task of these talks is a radical reduction in military potentials of both alliances and attainment of a situation on the continent in which NATO and Warsaw Pact countries will retain forces and assets necessary for defense but insufficient for carrying out a surprise attack or conducting offensive operations."

Footnotes

1. For the beginning of the article see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1989, pp 19-25—Ed.

6904

Armored Recovery Vehicles

18010693e Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 26-35

[Article by Col N. Fomich]

[Text] In the opinion of foreign specialists, tanks continue to be the principal army striking force. In recent years qualitatively new tanks capable of accomplishing combat missions under present-day conditions have become operational in armies of the main capitalist countries. At the same time, foreign experts note than appropriate organization of armored equipment restoration including under field conditions is necessary to preserve the combat effectiveness of large and small tank units. To this end tank repair subunits must be equipped with recovery equipment, have well trained personnel, and have the necessary quantity of spare parts.

The ground forces of capitalist states use armored recovery vehicles [ARV's] for evacuating disabled tanks, IFV's, APC's, and self-propelled artillery from the battlefield as well as for repairing and maintaining equipment and performing cargo-handling and simple excavation work. As a rule, they are created on the basis of tanks and are equipped with a hoisting crane or crane jib, pulling winches (main and auxiliary), towing gear, and disassembly-installation and entrenching tools. A dozer blade used for excavation or as a support when extracting stuck armored equipment is mounted on the front of the majority of ARV's.

Armoring of the ARV's provides crew protection against small arms fire and fragments of artillery rounds and mines. Some models have air filtration and ventilation systems for purifying external air entering the manned compartment when crossing areas of radioactive or chemical contamination.

The ARV's use 7.62-mm or 12.7-mm machineguns as armament. An exception is the Swedish vehicle, which has a 20-mm automatic gun. Multibarrel grenade launchers are mounted on some models for laying smoke screens. All vehicles are equipped with radios.

Specifications and performance characteristics of ARV's being used in foreign armies are given in the table.

Specifications and Performance Characteristics of ARV's of Armies of Capitalist Countries

Model Designation	Combat Weight, tons/crew	Overall Dimensions, m: Height/ Length x Width	Engine Power, hp/Maximum Speed, km/hr	Range, km	Crane Load-Lifting Capacity, tons	Maximum Force of Pulling Winch, tons/ Cable Length, m
1	2	3	4	5	6	7
United States						
M88A1	50.8/4	2.9/8.26x3.4	750/48	450	23	40/61
ARV-90	./3	2.5/9.2x3.65	1,500/.	450	35	70/.
M578	24/3	2.9/6.4x3.1	425/55	725	13.6	27/70
M806A1	11.5/4	2.5/5.4x2.69	215/67	480	1.4	9/91
AAVR-7A1	24/5	3.28/8.2x3.27	400/72	480	2.7	14/85
Great Britain						
FV 4006	50/4	2.89/8.96x3.39	650/34	100	10	31/137
FV 4204	56/4	2.79/8.57x3.5	750/42	400	5.8	30/122
CR ARRV	62/5	2.96/9.6x3.55	1,200/59	.	5.8	52/.
ARV on Vickers Mk 3 chassis	36.8/4	2.89/7.56x3.16	720/50	600	4	25/122
FV 434	17.7/4	2.79/5.7x2.84	240/47	480	3	18/.
Samson	8.7/3	2.25/4.78x2.4	190/72	480	0.45	12/229
FRG						
Standart	39.8/4	2.69/7.57x3.25	830/62	500	20	35/90
France						
AMX-30D	38/4	2.65/7.5x3.15	700/60	650	15	35/100
AMX-13D	15.3/3	2.6/5.6x2.6	250/60	400	5	15/50
AMX-10ECH	13.8/5	2.6/5.76x2.78	280/65	600	6	-/-
Italy						
ARV on OF-40 tank chassis	45/4	2.35/7.68x2.47	830/65	600	18	36/80
Spain						
M47 E2R	45.6/4	2.89/7.53x3.4	750/56	600	50	35/100
Japan						
70	35/4	3.1/8.4x2.95	600/45	200	.	35/.
78	38/4	2.4/7.95x3.38	750/53	.	20	38/60

Specifications and Performance Characteristics of ARV's of Armies of Capitalist Countries

Model Designation	Combat Weight, tons/crew	Overall Dimensions, m: Height/ Length x Width	Engine Power, hp/Maximum Speed, km/hr	Range, km	Crane Load-Lifting Capacity, tons	Maximum Force of Pulling Winch, tons/ Cable Length, m
1	2	3	4	5	6	7
Sweden Bgbv 82	26/4	2.6/7.2x3.25	310/56	400	5.5	20/145
Switzerland Pz65	38/5	3.35/7.6x3.15	660/55	350	15	25/120
Austria Greif	19.8/4	2.3/6.7x2.5	320/65	625	6	20/95

In the U.S. Army the M88 ARV created in the late 1950's on the M48 tank chassis is the principal means for field recovery and repair of tanks. Over 1,000 such vehicles were produced prior to 1964.

The closed hull of this ARV is welded from cast and rolled armor plates (maximum frontal armor thickness is 50 mm) and provides protection against bullets and shell fragments. The engine and transmission compartment is in the rear of the vehicle. There are armored doors along the sides for crew compartment access. Driver and mechanic seats are installed in the front part of the hull with armored hatches above them. The commander is accommodated in a rotating armored cupola in which a 12.7-mm machinegun is mounted.

The vehicle is equipped with a hoisting device, pulling winch, dozer blade, gas welding equipment, fueling equipment, and disassembly-installation and entrenching tools. The hoisting device consists of an A-shaped tubular jib hinged on the upper front of the vehicle (it folds back in a traveling position) and a hoisting winch installed behind the armored superstructure.

In 1973 American specialists created a modernized version, the M88A1, which in contrast to the base version has a diesel (instead of gasoline) engine and new transmission as well as an auxiliary engine (11 hp) and heater. This vehicle can be equipped for negotiating fords up to 2.6 m deep and with infrared night vision devices. There were 1,427 M88A1 ARV's produced by 1985. At the same time 876 of the M88 vehicles were refitted as this version.

In addition to the U.S. Army and Marines, the M88 and M88A1 ARV's are in the inventory of armies of the FRG, Greece, Portugal, Israel, South Korea, Austria, and Egypt.

A need arose for a more powerful armored recovery vehicle in connection with the arrival in the American Army of new M1 Abrams tanks, which are heavier in comparison with M60 series tanks. It is planned to purchase and supply some 840 new ARV's for the U.S. Army over a three-year period for a sum of over one billion dollars.

Two American firms, Bowen-McLaughlin-York and General Dynamics, are presently working to create such a vehicle. They already have fabricated five prototypes each, which were to undergo comparative tests in 1988. The first firm proposed a modernized version of its M88 ARV, designated the M88A1E1 (Fig. 1 [figure not reproduced], M88A2 after becoming operational). In contrast to the M88A1, the AVDS-1790-8DR 1,050-hp V-12 diesel engine and XT-14105A Allison automatic transmission were installed in it, suspension and brake system components were improved, new primary and auxiliary winches (maximum tractive force of the main winch is 63 tons) as well as a lengthened A-shaped crane jib (maximum lifting capacity 35 tons) were used, the armoring of the front of the hull was reinforced, and false sides can be mounted.

General Dynamics created the ARV-90 (Fig. 2 [figure not reproduced]) based on the M1A1 Abrams tank. Its armored hull provides protection against small-caliber projectiles. A system for creating overpressure in the crew compartment is provided for crossing contaminated terrain sectors. The special equipment of this ARV includes a rotary hoisting winch, primary and auxiliary pulling winches, and a dozer blade mounted on the front of the hull. Equipment drives are hydraulic. A place is provided on the vehicle for transporting the power plant of an M1 or M1A1 Abrams tank. It is planned to use a system for built-in monitoring of on-board equipment, a navigation system, and a driver's thermal imaging vision

device on series models for operations under nighttime conditions. The tentative cost of one ARV-90 is around $1.4 million.

The M578 light ARV is used for recovering and repairing light tanks, APC's and self-propelled artillery in the U.S. Army. It was created on the basis of a general-purpose tracked chassis which also was used in the M107 and M110 self-propelled artillery mounts. A rotating armored cabin with hoisting winch is installed in the rear part of the hull. A 12.7-mm machinegun is mounted above the commander's hatch. The vehicle is equipped with two pulling winches, a spade, and necessary tools and devices.

In the 1960's the M578 was produced by the Food Machinery Chemical Corporation (over 800 produced), and from 1971 through 1983 by Bowen-McLaughlin-York (1,018 vehicles). In addition to the U.S. Army, this ARV was purchased by a number of capitalist countries including Great Britain, Spain, the Netherlands, Norway, Iran, Saudi Arabia and the Philippines.

The M806A1 light amphibious ARV created on the basis of the M113A1 tracked APC is intended for providing necessary assistance to APC's.

In 1970 the AAVR-7A1 ARV became operational with the U.S. Marines (54 were delivered); it represents the AAV amphibious tracked APC (previously designated the LVTP-7A1) equipped with special means including a hydraulic hoisting crane, pulling winch, welding equipment, air compressor, dc generator and all necessary tools. The ARV is armed with a 7.62-mm machinegun (unit of fire 1,000 rounds).

The **British** Army used the FV 4006 ARV created in the first half of the 1950's based on the Centurion Mk 2 tank for a long time. It was also supplied to the armies of Denmark, Israel, the Netherlands, Sweden, Switzerland and the Republic of South Africa. In the mid-1970's it began to be replaced by a new vehicle, the FV 4204, which is the tracked chassis of the Chieftain Mk 5 tank with appropriate equipment installed on it. The middle section of the hull accommodates the crew compartment and the front section the driver's seat (on the left) and pulling winch (on the right). The crew compartment is equipped with a system for protection against weapons of mass destruction and a heater. Along the sides are boxes with tools and devices.

A dozer blade with hydraulic drive is mounted in front of the hull. Some vehicles supplied to Iran were equipped with a hydraulic rotary crane. After Challenger tanks became operational with the British Army that crane also began to be mounted on other FV 4204 ARV's. In addition, a place is provided on them for carrying a spare tank engine. The vehicle is armed with a 7.62-mm machinegun mounted in the commander's cupola. Six-barrel and four-barrel grenade launchers serve to lay smoke screens.

In 1984 the firm of Vickers Defence Systems began developing an ARV based on the Challenger tank. The first six preseries models (see color insert [color insert not reproduced]) already have been produced at the present time and it was planned to begin series production this year. The initial order was for 26 vehicles. Each tank regiment equipped with Challenger tanks will receive five such ARV's.

As noted in the foreign press, the new British vehicle is characterized by good armor protection, high mobility including on rugged terrain, and the presence of powerful special equipment which allows its crew to successfully perform the task of recovering damaged tanks from the battlefield and performing necessary repairs.

The closed hull of this ARV is welded from armor plates. Its front section contains the driving compartment (on the left) and a place for the pulling winches. The commander is accommodated behind the driver. A 7.62-mm machinegun, day sight (replaced by a night sight in hours of darkness) and ten periscopes for all-around observation are installed in the commander's armored cupola, which has 360 degree rotation. The engine and transmission compartment is situated in the rear of the hull. The running gear suspension is hydropneumatic. There are systems for protection against weapons of mass destruction and extinguishing fire.

This British ARV, with the conventional designation CR ARRV, is fitted with a dozer blade, rotary hoisting crane, powerful main winch, welding equipment, compressor, and the necessary set of tools and devices. Drives of the primary equipment are hydraulic. A place is provided in the vehicle for carrying a Challenger or Chieftain tank power plant.

The aforementioned firm of Vickers Defence Systems supplied Kenya and Nigeria with its own Vickers Mk 3 tanks and a small number of ARV's created on their basis in the early 1980's. They are equipped with a spade and pulling winches and some have a hydraulic hoisting crane. On an initiative basis this firm also created (for export) a modular design of equipment for installation on any tank chassis for use as an ARV. It includes an armored turret with hoisting crane, pulling winches and dozer blade mounted on the front of the hull.

The FV 434 ARV created in the mid-1960's on the basis of the Trojan tracked APC is used by repair subunits chiefly for repairing and servicing armored equipment. To this end it is fitted with all necessary equipment and tools. A rotary hoisting crane is used for replacing some machine units. There is a version of the Trojan APC equipped with a pulling winch for recovering light armored vehicles.

Simultaneously with the creation of a family of light armored combat vehicles based on the light Scorpion reconnaissance tank, another English firm, Alvis, developed the Samson ARV for them. It has a pulling winch

and spade mounted in the rear of its hull. Loads weighing up to 450 kg are hoisted using a small A-shaped crane jib. The vehicle is equipped with an individual flotation device made in the form of folding skirts fastened along the perimeter of the hull. Movement afloat is accomplished by churning the tracks. In addition to Great Britain, this ARV has been supplied to Belgium, Oman and Thailand.

One of the latest developments of British specialists is the MRV(R) ARV, shown in Fig. 3 [figure not reproduced]. It was created on the basis of the Warrior MCV-80 infantry fighting vehicle. The ARV is equipped with a hydraulic hoisting crane, pulling winch and spade (in the rear of the hull). A 7.62-mm machinegun is mounted in the commander's cupola.

In the **FRG** the firm of Porsche created the Standart ARV based on the Leopard 1 tank. Its series production was accomplished by the firm of Krupp MaK Maschinenbau. In the period from 1966 through 1969 729 vehicles were produced, of which 444 were supplied to the Bundeswehr and the rest to armies of Belgium, Italy, Canada, the Netherlands, Norway, Australia and Turkey. In addition, 69 vehicles were produced under license by the Italian firm of OTO Melara.

Foreign experts note that the Standart ARV is characterized by the presence of powerful special equipment and is comparable with the Leopard 1 tank in mobility. It uses a moving block (load pulley block) for recovering stuck tanks which permits doubling the tractive force of the winch (Fig. 4 figure not reproduced]). The dozer blade serves as a support for this. Using the rotary (by 270°) hoisting crane it is possible to disassemble and install a tank turret, power plant and running gear components. The crane and dozer blade drives are hydraulic. The ARV is armed with two 7.62-mm machineguns and is fitted with an air filtration and ventilation system. The vehicle can cross water obstacles up to 4 m deep using equipment for operating a vehicle under water.

In 1978 100 modernized Standart ARV's, designated the BPz-2A2, were delivered to the FRG Army. The principal task of modernization consisted of improving the crane's capabilities of disassembling turrets in the Gepard self-propelled antiaircraft mount and Leopard 2 tank that are heavier than for the Leopard 1 tank. To this end the crane jib was reinforced, a larger capacity oil pump was used in the hydraulic system, and an additional backward-folding support (a hydraulic cylinder with plunger) was mounted at the rear of the vehicle, used together with the dozer blade to relieve the load on the running gear suspension with the crane operating in the maximum power mode (the load-hoisting capacity is being increased to 25 tons).

At the present time the West German firms of Porsche and Krupp MaK Maschinenbau are developing the Bergpanzer-3 ARV on the basis of the Leopard 2 tank; it is to be outfitted with powerful special equipment.

The principal ARV in the **French** Army is the AMX-30D (Fig. 5 [figure not reproduced]), created on the basis of the AMX-30 tank soon after the latter became operational.

In the mid-1950's production began on the AMX-13D light ARV, developed on the tracked chassis of the AMX-13 light tank. An armored cabin for two crew members is located in the midsection of the hull and in the rear are four folding anchors used as supports while stuck armored vehicles are being extracted. This ARV has an A-shaped crane jib and pulling winch and is armed with a 7.5-mm or 7.62-mm machinegun.

In the opinion of foreign experts, the AMX-30D ARV is comparable in characteristics with the West German Standart. It has similar equipment with hydraulic drives and usually carries a spare tank engine. The presence of a system for protection against weapons of mass destruction permits it to operate on contaminated terrain. The vehicle is armed with a 7.62-mm machinegun installed on the commander's cupola. Over 130 such ARV's have been delivered to the French Army. They are also present in countries where the AMX-30 tanks are operational (Venezuela, Greece, Spain, Peru, Saudi Arabia).

French specialists also created an ARV based on the AMX-10P infantry fighting vehicle. It is operational with the Saudi Arabian Army, where it is used basically for repairing the AMX-10P IFV. The load-hoisting capability of the hydraulic crane is 6 tons. There is no pulling winch. The vehicle is equipped with the necessary set of tools and devices. A single-place armored turret is in the midsection of the hull; a 20-mm automatic gun and coaxial 7.62-mm machinegun are mounted in it. The ARV, designated the AMX-10ECH, is amphibious and is equipped with an air filtration and ventilation system, passive infrared night vision devices, and a radio. There is a crew of five, including three repairmen.

In **Italy** the firm of OTO Melara created the OF-40 tank and the ARV based on it. They have been supplied to the United Arab Emirates.

The Italian ARV (Fig. 6 [figure not reproduced]) has an armored superstructure which accommodates three crew members. The basic equipment includes a hoisting crane, pulling winch and dozer blade. The drives are hydraulic. Behind the superstructure is a place for carrying a spare power plant. The vehicle is armed with a 7.62-mm machinegun. Smoke grenade launchers are mounted on the right side of the superstructure.

In **Spain** the firm of Talbot created prototypes of the M47 E2R ARV on the basis of the obsolete American M47 tank. A new 750-hp AVDS-1790-2A diesel engine and new CD-850-6A Allison hydromechanical transmission were installed on the vehicle. An armored superstructure is located in the front section of the hull on the left and a powerful rotary hydraulic hoisting crane is mounted on the right. The vehicle also is equipped with

a pulling winch and dozer blade. A place has been fitted above the engine and transmission compartment for a spare tank engine. The ARV is armed with two machineguns, a 12.7-mm and a 7.62-mm.

The 70 ARV was adopted for the **Japanese** Army in 1970. It is the tracked chassis of the 61 tank with an armored superstructure and the necessary equipment mounted on it: an A-shaped crane jib, pulling winch and dozer blade. The vehicle is armed with a 12.7-mm machinegun.

Production of the new 78 ARV (Fig. 7 [figure not reproduced]) created on the basis of the 74 tank began in the late 1970's. It is similar in design to the West German Standart. The hydropneumatic running gear suspension is disengaged when performing load-hoisting operations. The vehicle is armed with a 12.7-mm machinegun installed above the commander's hatch. It is planned to deliver a total of 50 such ARV's for the Japanese ground forces.

The light Bgbv 82 ARV (Fig. 8 [figure not reproduced], a total of 24 delivered) is used in the **Swedish** Army for field recovery and repair of STRV-103B tanks and PBV-302 APC's. Its hull is welded from steel armor plates. The crew compartment is located in its front section. Behind it is the cargo compartment in which a heavy winch and hydraulic hoisting crane are mounted. A place for a spare tank engine is equipped there as well. Two anchors which fold downward and are used as supports when extracting stuck tanks are mounted at the rear of the vehicle. The ARV uses a 20-mm automatic gun mounted in a rotating armor turret as armament. The vehicle negotiates water obstacles afloat without preliminary preparation.

The **Swiss** Army is outfitted with the Pz65 ARV of its own development and production. They replaced the obsolete British FV 4006 vehicles. The first models of the Pz65 used the chassis of the Pz61 tank, and later ones used that of the Pz68. The ARV has a closed armored hull (Fig. 9 [figure not reproduced]). A dozer blade with hydraulic drive is mounted in front. The vehicle also is fitted with a pulling winch, auxiliary winch and A-shaped crane jib. A 7.5-mm machinegun is mounted on the hull roof. A four-barrel grenade launcher serves for laying smoke screens. Production of this ARV continues at the present time. The total number of Pz65's operational with the Swiss Army will be brought to 50.

In **Austria** the firm of Steyr-Daimler-Puch created the Greif ARV (Fig. 10 [figure not reproduced]) on the basis of the SK-105 Kurassier light tank in the mid-1970's. It is intended for battlefield recovery, repair and maintenance of tracked and wheeled armored combat vehicles weighing no more than 25 tons. This ARV is equipped with a rotary hoisting crane, main and auxiliary winches, as well as a dozer blade attached to the front of the hull. The crew is accommodated in an armored superstructure which contains a ventilation system and heater. The vehicle is armed with a 12.7-mm machinegun. A basket is mounted above the engine and transmission compartment for storing spare parts and devices. A certain number of Greif ARV's were supplied to armies of Argentina, Bolivia, Morocco and Nigeria.

The inventory of the **Argentine** Army consists of around 350 TAM tanks and VCTP infantry fighting vehicles created on the basis of the West German Marder IFV. An ARV was designed for their recovery, repair and maintenance using the tracked chassis of the TAM tank. A prototype of the vehicle has a closed armored hull with a hydraulic hoisting crane (maximum load-lifting capacity 22 tons) mounted on its right side. The winch tractive force is 30 tons. A spade used as a support when the crane or winch is operating is mounted on the rear of the vehicle. The ARV has a crew of four.

In **Belgium** the ARV was created on the wheeled (6x6) chassis of the SIBMAS amphibious APC, in contrast to models described above. It is equipped with a pulling winch (maximum force 30 tons), hydraulic crane (load-lifting capacity 8 tons) and spades at the front and rear of the hull. The working equipment drives are hydraulic. Necessary spare parts and tools are accommodated on the vehicle. The ARV is armed with a 7.62-mm machinegun. According to foreign press reports, 24 such vehicles have been supplied to Malaysia, which previously purchased over 160 SIBMAS wheeled APC's armed with a 90-mm gun installed in a two-place armored turret. The crew of the Belgian ARV is five, maximum highway speed is 100 km/hr, and the range is around 1,000 km.

British Challenger 2 Mk 2 Tank

18010693f Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) p 35

[Article by Col Ye. Viktorov]

[Text] Chieftain tanks of various modifications have been operational with the British Army for more than 25 years now. The question of replacing some 600 such vehicles with a more up-to-date model was being decided during 1988. The proposed candidates were the American M1A1 Abrams and West German Leopard 2 tank, but judging from western press announcements the British Defence Ministry chose the Challenger 2 Mk 2 Tank, which will be produced by the British firm of Vickers Defence Systems. By the end of 1990 it is planned to fabricate nine prototypes, three of which will undergo troop tests and six will undergo technical tests. It is planned to begin producing these tanks in 1992.

The Challenger 2 Mk 2 will have the tracked chassis of the Challenger tank and a new turret. It is planned to fabricate hull and turret out of the latest development in multilayered Chobham armor and to use the L30 120-mm rifled gun stabilized in two laying planes as the main armament.

The foreign press emphasizes that the Challenger 2 Mk 2 tank will be fitted with the latest fire control system, which includes a stabilized gunner's main sight with laser rangefinder and thermal imaging unit (the image of the terrain being observed is transmitted to commander's and gunner's displays); a stabilized commander's sight by the French firm of SFIM mounted on the turret roof; and a second-generation electronic ballistic computer, which is an improved version of the computer being used on the American M1A1 Abrams tank. Redundant weapon control is provided—the gun also can be fired by the tank commander if necessary.

Effective Combat Strength of Ground Forces of Selected Capitalist States (Less NATO)

18010693g Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 36-38

[Reference data[1] by Col V. Titov]

[Text]

Country, Numerical Strength of Ground Forces (thousands)	Effective Combat Strength, Primary Armament
1	2
Sweden, 47 (peacetime)	In peacetime: 42 mobilization training and training regiments (16 infantry, 2 cavalry, 6 armored, 6 artillery, 4 antiaircraft artillery, 2 signal, 3 engineer, and 3 logistic support); in wartime it is planned to activate 18 infantry brigades, 5 Norrland infantry brigades, 5 armored brigades and 1 mechanized brigade as well as over 60 separate infantry and armored battalions and artillery and AAA battalions from which infantry divisions can be constituted (15,000 persons, 2 infantry brigades, 1 armored brigade and support subunits in each). Armament (counting that stored at depots): around 1,000 tanks (including 335 STRV-103B's), over 1,000 field artillery pieces, 500 120-mm mortars, antitank weapons, and army aviation helicopters.
Switzerland, 13 (peacetime)	In wartime: over 600,000 personnel, 3 army corps (1 mechanized division and 2 infantry divisions in each), a mountain corps (3 mountain infantry divisions), 17 separate brigades (11 border, 3 fortress and 3 field fortification), 6 territorial zones (they include 13 medical, 12 rear and 11 civil defense regiments). Armament: over 850 tanks (Pz-68, Pz-61, Pz-87 Leopard 2, Pz-55 Centurion), some 1,200 field artillery pieces, around 300 mortars, and antitank weapons.
Austria, 50	Readiness forces (around 15,000): mechanized infantry division (3 mechanized infantry brigades), AAA battalion, signal battalion and engineer battalion. Landwehr forces: 2 corps headquarters, 9 Land military commands, 30 mobilization training regiments, and separate subunits. Armament: 170 tanks (50 M60A3 and 120 M60A1, which are to be replaced by M60A3 tanks), some 200 field artillery pieces (of which 56 are M109A2 155-mm self-propelled howitzers), mortars, and antitank weapons.
Japan, 180	5 army headquarters, 1 tank division and 12 infantry divisions (5 with 7,000 persons each and 7 with 9,000 persons each), 13 separate brigades (2 mixed, 1 airborne, 1 artillery, 2 Hawk SAM, 1 helicopter, 1 signal and 5 engineer) and 6 separate groups (2 artillery and 4 Hawk SAM). Armament: 1,170 tanks (460 Type 61 and 710 Type 74), over 800 field artillery pieces (including more than 200 Type 75 155-mm self-propelled howitzers), 50 Type 30 self-propelled rockets, some 100 130-mm multiple-launch rocket systems, antitank weapons (including around 300 Type 64 and Type 79 ATGM launchers), 200 Improved Hawk SAM launchers, 140 Stinger portable SAM systems, and around 450 army aviation helicopters.

Country, Numerical Strength of Ground Forces (thousands)	Effective Combat Strength, Primary Armament
1	2
South Korea, 540	3 army headquarters, 6 army corps headquarters, 19 infantry divisions (15,000-18,000 persons), 2 mechanized divisions (15,000), 7-10 reserve divisions, 16 separate brigades (2 tank, 2 infantry, 7 special purpose, 2 AAA, 2 SAM, 1 army aviation), 2 Honest John rocket battalions, separate battalions, and field artillery battalions. Armament: Over 1,500 tanks (M47, M48, M48A5K, M60), over 3,500 field artillery pieces, 12 Honest John rocket launchers, 100 Nike Hercules SAM launchers, 120 Hawk SAM launchers, antitank weapons, and army aviation helicopters (of which 50 have the TOW ATGM).
Taiwan, 300	3 field army headquarters, 6 army corps headquarters 1 special forces headquarters, 12 heavy infantry divisions (15,000), 6 light infantry divisions (4,500), 2 mechanized infantry divisions, 9 reserve divisions (reduced-strength, 3,000 each), 8 separate brigades (6 armored and 2 airborne), 4 armored groups, 2 armored cavalry regiments, 4 special purpose groups, 5 separate SAM battalions (2 with Nike Hercules and 3 with Hawk), 6 army aviation companies, 20 separate field artillery battalions. Armament: over 1,100 tanks (of which more than 300 are M48A5 and the rest are M24 and M41), more than 1,600 field artillery pieces, antitank weapons (including TOW and Kun Wu ATGM's of their own production), over 120 Nike Hercules and Hawk SAM launchers, 20 Chaparral SAM systems, and around 120 army aviation helicopters.
Philippines, 70	5 infantry divisions, 8 separate brigades (2 infantry, 1 armor, 1 special purpose, 3 engineer and 1 military police), 4 artillery regiments, 1 ranger regiment. Armament: around 30 Scorpion light tanks, 45 YRP-765 IFV's, around 250 APC's (of which 80 are M113's), more than 250 field artillery pieces, antitank weapons.
Indonesia, 216	2 infantry divisions, 60 separate infantry battalions, 8 mechanized infantry battalions, 4 airborne battalions, 7 field artillery battalions and 6 AAA battalions. Armament: around 150 light tanks (basically the AMX-13), over 500 APC's and armored vehicles, more than 200 field artillery pieces, over 500 antitank weapons, around 50 army aviation helicopters.
Malaysia, 90	Army corps headquarters, 4 infantry division headquarters, 9 separate infantry brigades, 1 separate special purpose regiment, and separate combat support and combat service support battalions. Armament: 26 Scorpion light tanks, around 1,000 APC's and armored vehicles, over 200 field artillery pieces, and antitank weapons (including SS-11 ATGM launchers).
Thailand, 166	13 divisions (7 infantry, 2 mechanized infantry, 2 special purpose, 1 artillery, 1 AAA), 8 separate infantry battalions, and 11 engineer battalions. Armament: over 550 M24, M41, M48A5 and light Scorpion tanks (counting those at depots), around 800 APC's and armored vehicles, approximately 500 field artillery pieces, antitank weapons (including TOW and Dragon ATGM launchers), and around 120 army aviation helicopters.
Bangladesh, 90	5 infantry division headquarters, 7 separate infantry brigades, 6 separate engineer battalions. Armament: around 100 tanks, over 500 field artillery pieces, and antitank weapons (recoilless guns, 57-mm and 76-mm guns).
Pakistan, 450	7 army corps headquarters, 19 divisions (17 infantry and 2 armored), 23 separate brigades (8 infantry, 4 armored, 8 artillery and 3 AAA), 6 reconnaissance regiments and a special purpose group (3 battalions). Armament: over 1,600 tanks (including more than 1,000 Type 59), over 1,500 field artillery pieces, antitank weapons (of which around 300 are TOW ATGM launchers) and around 100 army aviation helicopters.
Saudi Arabia, 50	12 brigades (4 infantry, 5 mechanized, 2 armored, 1 airborne), 5 artillery battalions, 18 AAA batteries. Armament: over 800 tanks (including 300 AMX-30, 150 M60A1 and 100 M60A3), over 1,300 IFV's, APC's and armored vehicles (including 300 AMX-10P and 800 M113), over 500 field artillery pieces, and antitank weapons (including TOW, Dragon and HOT ATGM launchers.

Country, Numerical Strength of Ground Forces (thousands)	Effective Combat Strength, Primary Armament
1	2
Jordan, 74	4 divisions (2 mechanized and 2 armored), 2 separate brigades (1 Royal Guard infantry brigade, 1 special forces brigade), and separate combat support and combat service support subunits. Armament: over 900 tanks (M48A5, M60A1, M60A3, Centurion and Khalid, i.e., a modernized Chieftain), over 300 field artillery pieces, more than 1,300 ARV's, APC's and armored vehicles (including more than 1,000 M113's), and around 900 antitank weapons (including around 300 TOW and over 300 Dragon ATGM launchers).
Israel, 135	3 armored divisions, separate units, and combat support and combat service support subunits, including a Lance guided missile battalion. Armament (counting that stored at depots): around 4,000 tanks (M60A1, M60A3, M48A5, Merkava, Centurion), over 1,200 field artillery pieces, 12 Lance guided missile launchers, and antitank weapons (including TOW, Dragon and Cobra ATGM launchers).
Egypt, 320	2 field army headquarters, 12 divisions (3 infantry, 5 mechanized and 4 tank), over 15 separate brigades (tank, infantry, mechanized, airborne and air assault), 14 separate artillery brigades, 7 special purpose groups, combat support and combat service support subunits and units. Armament: over 2,400 tanks, more than 1,500 field artillery pieces, over 3,000 antitank weapons (including 520 TOW, 220 Milan and 200 Swingfire ATGM launchers).
Sudan, 70	6 divisions (5 infantry and 1 tank), 2 separate brigades (border and air assault), and separate combat support and combat service support units and subunits. Armament: more than 300 tanks, field artillery pieces, antitank weapons.
Somalia, 90	12 infantry divisions, over 40 separate brigades (infantry, mechanized, tank, airborne), separate combat support and combat service support subunits. Armament: over 350 tanks, field artillery pieces, antitank weapons (including Milan and TOW ATGM launchers).
Kenya, 15	3 separate brigades (2 infantry and 1 armored), 1 engineer brigade, 9 separate battalions (5 reduced-strength infantry, 1 reconnaissance, 2 engineer, 1 airborne), combat support and combat service support subunits. Armament: 76 Vickers Mk 3 tanks, over 100 field artillery pieces, antitank weapons, around 50 army aviation helicopters (of which 15 are 500 MD's with TOW ATGM's).
Republic of South Africa, 100	8 separate brigades (5 mechanized infantry, 1 mechanized, 1 tank and 1 airborne), 5 separate armored regiments, 1 assault-reconnaissance regiment, over 90 separate battalions, 9 field artillery regiments, 1 antiaircraft missile regiment, 11 AAA regiments, 15 field engineer squadrons, and combat support and combat service support subunits. Armament: over 400 tanks (Centurion and Elephant), 3,600 APC's and armored vehicles, over 300 field artillery pieces, antitank weapons (there are SS-11, Milan and Entac ATGM systems).
Zaire, 32	2 divisions (1 infantry and 1 special purpose), 3 separate brigades (2 infantry and 1 tank), separate combat support and combat service support subunits. Armament: over 60 tanks, more than 100 field artillery pieces, antitank weapons.
Nigeria, 100	4 divisions (2 mechanized, 1 armored and 1 mixed), separate brigades (artillery, engineer and so on). Armament: around 150 tanks (including Vickers Mk 3 and Scorpion), over 350 field artillery pieces, antitank weapons.
Morocco, 150	5 separate brigades (3 mechanized infantry, 1 airborne and 1 light security), 11 separate regiments (4 mechanized infantry and 7 mechanized), 11 separate battalions (10 artillery and 1 AAA), separate battalions (mechanized infantry, tank, airborne, commando and others). Armament: over 250 tanks, more than 200 field artillery pieces, antitank weapons (including TOW, Milan and Dragon ATGM launchers).

Country, Numerical Strength of Ground Forces (thousands)	Effective Combat Strength, Primary Armament
1	2
Mexico, 105	4 brigades (2 infantry, 1 mechanized and 1 airborne), 3 separate armored cavalry regiments, 3 separate artillery regiments, 21 separate motorized regiments, approximately 70 separate infantry battalions, and combat support and combat service support subunits. Armament: 45 M3 and M8 light tanks, over 100 field artillery pieces, antitank weapons (including Milan ATGM launchers).
Honduras, 16	3 infantry brigades, 2 separate regiments (armored cavalry and artillery), 5 separate battalions (2 infantry, 2 special purpose and 1 engineer), separate combat support and combat service support subunits. Armament: 15 light tanks (12 Scorpion and 3 Scimitar), field artillery pieces, antitank weapons.
El Salvador, 39	7 separate brigades (6 infantry and 1 artillery), 1 separate armored cavalry regiment and 9 separate battalions. Armament: 12 AMX-13 light tanks, over 50 field artillery pieces, antitank weapons.
Venezuela, 34	5 divisions (3 infantry, 1 jungle infantry, and 1 cavalry), 1 separate special purpose brigade, 5 separate regiments (presidential guard, army aviation, airborne, engineer, and military police), 1 squadron of light aircraft, 1 squadron of army aviation helicopters, and other combat support and combat service support subunits. Armament: over 150 tanks (of which 81 are AMX-30, 36 are AMX-13), over 150 field artillery pieces, antitank weapons, over 20 army aviation helicopters.
Brazil, 218	8 divisions, separate combat support and combat service support units and subunits. Armament: around 600 tanks: M3, M41B, X-1A and X-1A2 (a modernized M3), around 900 field artillery pieces, antitank weapons (including around 300 Cobra ATGM launchers).
Chile, 57	6 divisions (5 infantry and 1 mountain infantry), one separate infantry brigade, combat support and combat service support units and subunits. Armament: around 300 tanks (21 AMX-30), field artillery pieces, antitank weapons (including Milan and Mamba ATGM launchers), army aviation helicopters.
Argentina, 55	4 army corps headquarters, 9 brigades (3 mechanized infantry, 2 armored, 2 mountain infantry, 1 airborne, 1 jungle infantry), separate combat support and combat service support units and subunits. Armament: tanks (including 350 TAM and 60 AMX-13), field artillery pieces, antitank weapons (including Cobra, Mathogo, and Mamba ATGM launchers), army aviation helicopters.
Australia, 32	One infantry division (2 infantry brigades and 1 mechanized infantry brigade, 8 regiments: 1 reconnaissance, 1 APC, 4 artillery, 1 engineer, 1 army aviation). Armament: over 100 Leopard 1A3 tanks, around 300 field artillery pieces, antitank weapons (including Milan ATGM launchers), army aviation helicopters (of which around 50 are Kiowa OH-58B).
New Zealand, 6	2 infantry battalions, 1 tank battalion, 1 artillery battery, combat support and combat service support subunits. Armament: around 30 Scorpion light tanks, around 80 M113 APC's, over 50 field artillery pieces, antitank weapons.

Footnotes

1. For effective combat strength of NATO armies see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1989, pp 33-36—Ed.

Survivability of Aircraft in the Air in Conducting Combat Operations (Based on Experience of Local Wars)

18010693h Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 39-44

[Conclusion of article by Col V. Kirillov, candidate of military sciences]

[Text] Part One of the article[1] briefly set forth views of foreign military specialists on factors exerting a direct influence on survivability of aircraft in the air in conducting combat operations. In particular it considered such factors as "threat" and "protection." Two more factors, conditionally called "evasion" and "neutralization" will be covered below.

The **"evasion" factor** reflects an aircraft crew's capability of avoiding encountering air defense weapons during a flight to a strike target.

Five evasion techniques became most common in local wars: cross-country flight to bypass enemy air defense weapon kill zones; use of a variable flight profile; use of "blind spots" in the enemy radar field; and fighter-evasion and missile-evasion maneuvers.

The availability of reliable data on the enemy air defense system was of great importance here. The commander or pilot would plot detection, tracking and kill zones of antiaircraft weapons on the flight chart. The flight route would be laid out in intervals between detection or kill zones of air defense weapons or at the boundaries between them.

The appropriate evasion technique would be selected depending on the situation in different phases.

Experience showed that despite the rather wide spectrum of evasion techniques used during the flight to the target, priority goes to reduced flight altitude. In practice, however, the primary advantage of this maneuver—concealing the aircraft from enemy radar coverage—managed to be realized only after an increase in capabilities of on-board electronic systems. With an on-board radar permitting nap-of-the-earth flying and having adopted the tactic of lone flights at extremely low altitude, a wing of USAF F-111 fighter-bombers flew some 4,000 sorties in Indochina from September through December 1972 and lost only six aircraft. This is the lowest loss level (0.15 percent) in the entire history of local wars. An automatic terrain-avoidance system supported lengthy flight at extremely low altitude and relieved the crew of excessive physical stresses.

The system also allowed changing the direction of routes: instead of exposed target runs from the sea, the F-111A aircraft would approach strike targets across a mountain ridge on the western border of the DRV, obtaining additional opportunities for concealment. The element of concealment was fully used and the camouflage was natural, i.e., it required no activation of on-board EW equipment.

The tactic of lone, undetected raids (800 km radius) enabled rejecting the use of support aircraft—escort fighters, final reconnaissance aircraft, and jammers. The flight became completely self-contained. Fewer aircraft were in the kill zone of air defense weapons, which ensures freedom to choose the evasion maneuver.

The results of aircraft equipment tests under combat conditions sometimes were diametrically opposite to what was expected. Following the rule that "more speed means fewer rounds in the area of an aircraft covered by fire," designers expended much effort and means on realizing a supersonic low-altitude dash. According to their concept, this should have ensured the aircraft's invulnerability in penetrating air defense. It was planned for the F-111 fighter-bomber to demonstrate the advantages of this technique by flying at Mach 1.2 at extremely low altitude, but the "dash" was removed from practical use after the very first attempts for the following reasons.

First of all, it proved impossible to accomplish terrain avoidance (full concealment of the flight) at supersonic speed because of the sharp increase in vertical maneuver radii. The aircraft would be pressed upward above the relief by its speed and enter the enemy radar coverage. Secondly, the aircraft would begin to radiate heat in all directions, including forward, because of increased aerodynamic heating from friction at low altitude. There appeared a real threat of the use of surface-to-air missiles with a thermal homing head against it not only from the rear but also from the forward hemisphere. Thirdly, because of increased air turbulence jolting would begin and there would be a sharp increase in the load on the aircrew, which quickly lost working capacity. Fourthly, when flying in a supersonic regime at low altitude fuel was expended four times faster than at high altitude. And fifthly, it turned out that supersonic speed itself produced very few tactical advantages, which were overshadowed by many times by the shortcomings which arose. Increased flight speed near the ground contributed to aircraft survivability only up to certain Mach values, then insurmountable negative factors would enter into force.

Evasion techniques on the final leg of a combat mission differed considerably in trajectory, speed, g-loads and "altitude differential" from techniques used on a route when flying in the target vicinity. An aircraft would successively cross detection, tracking, fire and kill lines of SAM systems screening the strike target. A pilot was faced with a choice on entering a zone of detection: execute a maneuver with reduced speed for closing with the target and lose time, or cross the tracking sector in a penetration mode—on a straight line at increased speed—and gain time. The decision largely depended on the aircraft's range of acquisition by the SAM system radar, with acquisition registered by the on-board warning system. Premature detection forced undertaking a maneuver for thwarting lock-on, which was executed in a broad range and forced the missile guidance radar operator to shift from an automatic to a manual tracking mode. Command data for sighting systems would be generated with errors.

In the SAM system kill zone a pilot usually used two kinds of evasion maneuvers. The first consisted of having the aircraft quickly leave the danger zone and abort an attack on the target with the first pass. The pilot

would visually note the missile launch from the ground from the cloud of dust and smoke near the launcher or would receive a warning signal of the launch from the on-board warning system. With successful execution of the maneuver, the aircraft's time in the SAM system kill zone was less than the missile flight time to the conversion point of impact with the aircraft.

The second maneuver of escaping a launched missile was executed without the aircraft leaving the SAM system impact zone. In this case the pilot would notice the missile already in flight from the trail of smoke or flame. Allowing the missile to come to within 5-7 km of him, he would sharply turn the aircraft to a head-on course with a subsequent dive to extremely low altitude. With this maneuver, determining the moment for beginning it was the most difficult. Too early a maneuver (at a distance up to 15 km) did not lead to thwarting guidance—the missile would have enough control surfaces for an answering maneuver and choice of a lead angle. The missile's overshoot beyond the limit of the area of possible attack succeeded only if the aircraft began the maneuver at short range, at the line of increased risk. Despite the clear danger, this maneuver was used rather widely in local wars and was considered typical.

Missile-evasion maneuvers required much air space. Therefore group maneuvers of this sort were not noted in combat operations practice. Only dispersed combat formations could provide freedom for an aircraft to displace vertically and horizontally en route to the target. Organization of command and control and coordination was complicated here. In addition, vigorous maneuvering was precluded when the aircraft had a full combat load. It was necessary to reduce the number of suspended weapons or increase the number of aircraft in the strike element and consequently the number of targets passing through the kill zone of air defense weapons. Thus the evasion tactic encroached on related areas of combat employment, where not only its positive aspects, but also its negative aspects were manifested. A decrease in flight altitude made it impossible to deliver massive strikes. The forced use of small elements (pairs and flights operating independently of each other) had a negative effect on the density of raids. Strikes stretched out over time reduced to a minimum the advantages given by surprise and the continuity and sustained nature of fire pressure on the target. If the attack of the first pair or flight was a surprise, the appearance of the second (third and so on) pair no longer caught the target's air defense unawares; during the pause it prepared for engaging the next target.

As noted earlier, the use of advanced equipment in combat operations as well as the tactic of deep, low-altitude raids against enemy territory increased the survivability of tactical aviation, but lone strikes did not produce necessary results in the quality and quantity of destroyed targets and, in the opinion of the American command, had little influence on overall results of combat operations. A shift to massive raids and continuous pressure on targets was possible only after aviation's attack forces returned to medium altitudes, which permitted consolidating aircraft into large groups. This required radical new changes in tactics, however, based on another technical refitting.

A clear contradiction showed up between an increased combat payload of a strike aircraft and the need to maneuver with rather large g-loads and small turning radii. Foreign military specialists saw a solution to the situation in a new approach to questions of individual protection of fighter-bombers, the principal striking force of tactical aviation. Reliance was placed on massive use of EW assets.

The **"neutralization" factor.** "Neutralization" is taken to mean measures to protect the aircraft without employing defensive weapons. Above all this means electronic countermeasures, which preclude or hamper launches of missiles with radar homing heads against aircraft and the aimed firing of antiaircraft artillery equipped with gun-laying radars. Neutralization began to manifest itself as a means of passive defense in the Korean War. At that time the U.S. Air Force refitted several obsolete B-25 bombers as jammers of AAA gun-laying radars. In the Vietnam War the American command constituted special EW air subunits known as "Iron Hand." The range of their missions included detecting SAM system launch positions using on-board ELINT systems and screening attack aircraft carrying antiradiation missiles by means of jamming. Wild Weasel squadrons appeared (and remain to this day) as part of tactical aviation after acquisition, attack and defense equipment was consolidated in one aircraft (F-105, later the F-4).

Subsequently electronic countermeasures equipment grew quantitatively and was strengthened qualitatively. There was a considerable expansion in the set of measures it accomplished, which took on an offensive nature to a certain extent. These measures began to be called electronic warfare (EW) as a result of changes which occurred. As noted by the journal AVIATION WEEK AND SPACE TECHNOLOGY, the Vietnam War removed all doubt regarding EW as an effective means of protection and justified the efforts aimed at developing it.

The experience of local wars also showed that outfitting aircraft with EW equipment made it obligatory to develop methods of their combat employment which fitted in with tactics of aviation striking forces. In one case active jamming provides reliable camouflage in that it hampers enemy radar operators in determining target coordinates; in another case it permits direction-finding a source of jamming, neutralizing it by electronic means, or activating forces for its engagement. Three methods of electronic countermeasures appeared in local wars and

then were reflected in field manuals: using special aircraft to jam from zones, from a mixed combat formation, and jamming directly by strike aircraft for self-defense purposes. These methods have retained their significance to the present time. The alert zone of an EW aircraft was situated at a safe distance from enemy air defense weapons, usually over friendly territory. Powerful spot jamming would light up a narrow sector on the screen of the enemy ground radar within which the strike aircraft were supposed to approach the targets. The range of the line of detection of the strike aircraft depended on how closely their route coincided with the radar jamming sector. Use of this method in practice required arranging precise coordination of two elements in the overall system of group protection. If it was violated the jamming was merely a signal warning air defense weapons of the imminent threat.

The electronic equipment of aircraft which screened fighter-bombers by jamming from zones was constantly improved. The EA-6 EW aircraft refitted from an attack aircraft was capable of detecting a radar immediately after it was turned on, determining its type (based on emission parameters) and location (by direction-finding from two points), and creating active jamming on a selected frequency. The functions of ELINT and ECM were combined. But the aircraft's large flying weight (25 tons), limited maneuverability and low cruising speed (775 km/hr) did not permit including it in the combat formation of tactical strike aircraft. In addition, the relatively low jammer power forced assigning alert zones in the immediate vicinity of the area where the strike was delivered and subjecting the EW aircraft to increased threat.

Inasmuch as the effective jamming line was tens of kilometers from the EW aircraft alert zone and the fighter-bombers would invade enemy air space for hundreds of kilometers in delivering strikes, an acute question arose of covering (camouflaging) the combat formation to and from the target. Its simplest solution was to dispense passive jamming. In local wars this method was used constantly despite low effectiveness. In periods of intensive combat operations in Vietnam up to 4.5 tons of fiberglass chaff per day would be dropped from American aircraft. Most often this mission was accomplished by final reconnaissance aircraft in the strike elements' proposed target approach sector with a small lead time. A narrow jamming corridor would appear on enemy radar screens within which it was difficult for the operator to pick out the aircraft marker, but the corridor defined the direction of attack being prepared and oriented air defense weapons on it, and tuning off from the passive jamming was rather reliably supported by technical devices of SAM system radars.

Effectiveness of neutralization managed to be increased by active jamming by individual protection equipment, which included radar detector units and jammers. A removable pod with EW equipment which the pilot would turn on was suspended in place of one of the missiles or a fuel tank. The new equipment immediately caused changes in tactics.

Active jamming sources contained in the pods did not have high power. One aircraft with a jammer pod in a flight provided effective protection only for 2-3 other aircraft in the combat formation. The strike element formation would close up for more reliable camouflage, thereby hindering the execution of missile-evasion and fighter-evasion maneuvers. As a result American aircraft losses remained at the previous level and the question arose of creating built-in on-board EW equipment on each aircraft which would accomplish the neutralization task with sufficient effectiveness without significant detriment to the aircraft's combat features.

Of all tactical aviation in the USAF inventory, only on the F-15 fighter was EW equipment installed inside the fuselage (A-7 and A-10 attack aircraft and the F-16 fighter carry it in pods). The ALQ-99 with improved characteristics used in Vietnam on EA-6 aircraft was placed aboard the F-111A fighter-bomber and tested during the aggressive raid by American aviation on Libya in April 1986.

There was one such jammer aircraft, designated the EF-111A, in each of three groups of six F-111E aircraft which took off from UK airfields. These aircraft proceeded in a common combat formation; the EF-111A's were equipped with Sidewinder missiles in case they conducted defensive air-to-air combat. At a distance of 5,100 km from the take-off airfields the jammer aircraft left the combat formation before entering the area of strike targets and took up zones at a safe distance from the line of fire of ground air defense weapons. The strike aircraft organized target passes through the zones according to a version worked out in Vietnam. With a strike aircraft flying at low altitude the ALQ-99 gave it effective cover at a distance of 65 km. Jamming power in a CW mode exceeded 1 kw.

The USAF command is working to improve the organizational structure and combat training of EW subunits based on experience gained during local wars and armed conflicts.

At the present time USAF EW assets in the European zone are consolidated in the recently activated 65th Air Division. The division staff plans their use in combined-arms and air operations. A special flying zone has been established for training crews of EF-111A aircraft in "electronic warfare" tactics and in accomplishing coordination with Air Force striking forces and covering fighters. The 42d EW Squadron, which is part of the division and whose aircraft supported the piratic raid on Libya, has taken part in joint exercises with the 2d and 4th ATAF as well as with subunits of the USAF 16th Air Force in Spain. Three training missions were practiced:

—Jamming ground radars from beyond the limits of the zone of active countermeasures of "enemy" air defense weapons. A variant of high-altitude placement of alert zones at distances of 370-740 km from the combat zone was tested. An E-3A airborne early warning and control aircraft, an EF-111A jamming aircraft and a TR-1 reconnaissance aircraft took part in the mission. The system functioned in the interests of camouflaging "deep incursion forces."

—Execution of a low-altitude close-in version for supporting aircraft operations during close support of ground forces. In the initial position EW aircraft were in high altitude zones far from the line of contact. The jamming aircraft descended and came closer to the FEBA by the moment strike elements moved to the calculated point for initiating the run on the target.

—Escorting striking forces during a "deep incursion" into "enemy" territory. The EF-111A aircraft operated at low altitudes together with strike elements and created spot jamming of the operation of high-resolution radars. They climbed vigorously for a short time at the line of divergence in the target vicinity, a time corresponding to the duration of attack by the strike element on the move. Before the attack the fighter-bombers would turn on on-board repeat pulsed jammers with a system for high-frequency delay of relayed signals. When this happened false targets would appear next to the aircraft marker on SAM system radar screens, which would confuse the operator. Greatest effect was achieved in the case where the radar to be neutralized was operating in an automatic tracking mode when there would be lockon of the false target. An operator could distinguish a target against the jamming background, but this took time, which was limited on the high-speed attack leg.

The two latter versions were tested under real conditions during the bandit raid by American aviation on Libya.

The use of chaff strips and decoy flares occupied a rather noticeable place in individual aircraft protection. American fighter-bombers began to be equipped with suspended pods with cartridges filled with chaff strips and IR decoys. The pilot would fire the cartridges in a dive and on exiting the dive regardless of whether or not the aircraft was under fire. A surface-to-air missile with IR homing head was supposed to be drawn to the intensively emitting decoy flare, and a radar with radar homing to the dense cloud of chaff forming after the cartridge burst.

The foreign press announced both successful and unsuccessful outcomes of the use of decoy flares and chaff strips. Based on existing experience, the advisability of further development of these means of individual protection was seen in the direction of creating radar detection units which registered the moment a missile was launched by a low-altitude SAM system and instantaneously, without human involvement, transmitted a command for automatically firing cartridges with chaff strips and decoy flares. For now Westinghouse has been developing new ALQ-153 radars for rear hemisphere protection for accommodation on strategic B-52 bombers. Operating in an active emission mode, they permit warning a crew about an attack by missiles with IR homing heads and provide automatic dispensing of decoy flares.

The experience of local wars shows that the side poorly equipped with modern EW assets suffers heavy losses. In a short time during the recent conflict in the South Atlantic the Argentine Air Force lost 37 aircraft which had no means of individual protection.

After the Vietnam War ended the American Air Force received five million dollars for work to create electro-optical means of aircraft protection. Forty units generating a noncoherent signal for disorienting missiles with IR homing heads were placed in RF-4C tactical reconnaissance aircraft, A-7 attack aircraft and F-4 fighter-bombers. A tube source operated in the region of the spectrum corresponding to maximum emission of aircraft engine exhaust gases. When the unit was turned on the IR homing head of a missile moving toward the hot jet of exhaust gases would switch over to receiving jamming pulses of great magnitude (in comparison with the aircraft's own emission) and would shift to tracking the false target. A system shortcoming was the large pod dimensions (a diameter of 330 mm) and insufficiently high results in protecting an aircraft. At the present time tests continue abroad on prototypes of IR protection equipment.

Foreign military specialists emphasize that the problem of aircraft survivability in the air when conducting combat operations is assuming exceptionally great importance under present-day conditions.

An improvement in air defense technical outfitting and operating tactics makes it necessary also to take appropriate measures in aviation intended for strikes against the enemy. Success in future combat will be on the side of the one who is ahead in developing and introducing new means of protection and attack as well as the techniques and methods of employing them.

Footnotes

1. For beginning of article see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1989, pp 37-43—Ed.

B-1B Bomber Avionics

18010693i Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 44-50

[Article by Lt Col A. Bokov, candidate of technical sciences]

[Text] Primary attention in creating the new strategic B-1B bomber was given to developing on-board avionics costing 35-40 percent of the overall aircraft cost.

According to U.S. Air Force [USAF] requirements this equipment is called upon to support accomplishment both of the primary mission of penetrating enemy air defense and delivering nuclear and conventional weapons to the target, as well as certain other missions including reconnaissance, hunting and detecting submarines, and laying mines.

Modern principles of building electronic systems were made the basis for creating the aircraft's avionics. They include wide use of digital computers, a modular structure providing interchangeability of units and the possibility of building up systems, redundancy of the most important subsystems, and integration of equipment performing similar functions. Maximum use was made of equipment which already had been checked out in the modernized B-52G and B-52H aircraft as well as on the modern F-16 fighter to reduce time periods for development and the technical risk. The approach permitted a reduced cost of servicing and simplified logistic support. At the same time, a number of new and modernized pieces of equipment were installed in the B-1B bomber which considerably expanded its combat capabilities. On the whole, as noted in the foreign press, the latest S&T achievements were used in developing the B-1B and its avionics reflect the present level of on-board avionics development in the United States.

American aircraft specialists divide missions to be accomplished using the bomber's on-board avionics into offensive and defensive. The former include route navigation, arrival at the target area at low and extremely low altitudes, weapon employment, and maintaining radio communications with ground command posts and with other aircraft in the air. The latter include detection and crew warning of operating enemy electronics representing a threat to the bomber as well as reducing the effectiveness of this equipment, i.e., defensive missions reduce to EW missions. On-board B-1B avionics are divided into offensive and defensive in accordance with the type of mission to be accomplished.

On-board avionics are characterized by high saturation with computer equipment. The basis of the computer subsystem consists of eight 16-bit AP-101F computers, six of which service the offensive electronic system (three function constantly, permitting navigation, weapon delivery, and control of equipment and data display; one is in reserve; and two support the terrain-following mode). There is one computer each in the defensive avionics system and the central weapon control system. In addition, various subsystems use a large number of specialized processors. Computer speed is one million operations per second and main storage capacity is 128K words. Software is written in JOVIAL J3B language.

Data are transmitted between avionics systems and subsystems using a quadruple-redundant data transfer bus. The bus provides two-way data transfer between 9,000 inputs and outputs over two double-core cables at a rate of one megabit per second.

The basis of the offensive avionics system is the **AN/APQ-164 multimode monopulse radar** created on the basis of the F-16 fighter's AN/APG-68 radar with replacement of the moving-slit phased array with a solid-state array having electronic scanning. The replaceable units of both radars have the same size and external appearance, but are not interchangeable. The radar permits obtaining the fullest data necessary for executing combat missions. The range of operating frequencies is 8-10 GHz and the weight is 570 kg. The transmitter uses a traveling wave tube.

In the synthetic aperture mode the operator can select one of five scales determined by the size of the side of a square section of the Earth's surface—1.2, 2.4, 4.8, 9.6 or 18.5 km. Obtaining a high-resolution terrain image permits realizing the correction mode of the inertial navigation system (INS) based on radar reference points with known location, such as bridges. In this mode the INS outputs the coordinates of the checkpoint and the aircraft's current position to the computer. The operator places the crosshairs over the reference point image on the radar display. The INS error is automatically determined and correction is made in this manner.

The radar permits flying at altitudes down to 60 m. In the terrain following mode the radar determines terrain profile along the route at a distance up to 18 km. Data are updated continuously depending on the nature of relief. Ordinarily a correction is made every 3-4 seconds. Work in this mode increases the radar's concealment. The display shows the terrain profile ahead along the aircraft's course and distance to dangerous sectors when flying at a given altitude. Inasmuch as one scan is made in less than one second with terrain following, it becomes possible for the radar to operate in parallel in several modes with time division. Here each crew member is issued individual data. Terrain following can be done both in an automatic and a manual mode. In a collision avoidance mode the aircraft maneuvers in the azimuthal plane.

The radar's phased array is an elliptical planar array which includes 1,526 phase shifters and emitting elements. The phased array's mean-time-between-failures is 10,000 hours. Considering the phased array's high reliability, the USAF command does not plan to perform maintenance on it in line units; disassembly and inspection will be accomplished only when the aircraft goes to the repair shop after several years of operation.

The antenna is housed in the nose section of the B-1B and provides a plus or minus 60° scan sector in the azimuthal plane. The time for switching the position of the main lobe of the radiation pattern is 0.15-0.2 milliseconds. A mechanical displacement of the antenna by 90° to the right or left relative to the aircraft axis is provided for side surveillance in the synthetic aperture mode. The phased array plane is tilted 35° downward to reduce the aircraft's signature.

American specialists include among the advantages of the phased array the possibility of forming a radiation pattern of different types for radar operation in several modes. The phased array also permits quickly changing the polarization of sounding signals to improve target selection against the background of reflections from clouds and the underlying surface. The phased array weighs more than a conventional antenna, however, and is around 180 kg.

Special attention in creating the AN/APQ-164 radar was given to ensuring high reliability and reducing maintenance costs. The radar has two independent channels, one of which is in reserve. Thus the radar is fully redundant with the exception of the phased array, which made it possible to bring the probability of the radar's faultless operation for a 15-hour flight to 0.99. It is reported that the cost of maintaining the radar is three times less than the purchase cost. This is ensured by redundancy and by using a built-in inspection system which localizes 95 percent of malfunctions at the level of an individual module. Foreign specialists believe that the next phase in improving the radar will be to create a set completely out of solid-state instruments and to use a phased array of active elements, each of which will include a receiver, transmitter and phase shifter.

The **SKN-2440 inertial navigation system** is used to determine aircraft position, speed and heading. High INS effectiveness is achieved by use of precision inertial components, a fast digital computer, and mathematical drift compensation. Accuracy in determining coordinates is 0.46 km per hour of flight. The INS also is used to stabilize the radar. The INS can output data both in digital and analog form. The measuring unit's gyrostabilized platform is accommodated on a four-frame gimbal suspension. One vertical and two horizontal accelerometers and two double-axis gyroscopes are mounted on the platform. The INS adjustment can be made both on the ground and in the air. The INS weighs 17.3 kg and overall dimensions are 485x194x191 mm. The system is designed to be accommodated in two easily detachable units.

A self-contained **NAS-26 astroinertial system** which supports global navigation was installed in the first three series B-1B bombers as a supplement to the main INS. The ephemerides of 61 stars can be written in the system computer memory. The tracking device searches for and identifies given stars at a rate of three stars per minute. System adjustment can be made in the air or on the ground. System accuracy (CEP) in the astroinertial mode (with periodic star tracking) is no worse than 330 m for ten hours of flight, and without correction on the stars it is 0.9 km per hour of flight. The system weight is 66.8 kg and the volume is 0.35 m^3. Mean-time-between-failures is 800 hours.

An **AN/APN-218 Doppler velocity and drift meter** is installed in the B-1B aircraft (some foreign publications note that a modified version of this Doppler velocity and rate meter, designated the AN/APN-230, is used). The basic advantages of the AN/APN-218 are determined by two technical solutions: use of continuous emission and the narrowly directional array. The Doppler velocity and drift meter is quadruple-beam (beam forming is with time division) and provides for measuring parameters when flying over land or a calm sea surface at speeds of 180-3,330 km/hr in an altitude range of 0-23 km. Transmitter output is 1.5 watts at the working frequency of 13.325 GHz. Mean-time-between-failures is 3,000 hours. The Doppler velocity and drift meter is designed in the form of a sensor block and two indicator and control blocks with dimensions of 716x645x170, 146x76x155 and 146x152x165 mm respectively. Overall weight of the Doppler velocity and drift meter is 37.3 kg.

The offensive avionics system also includes two altimeters, communications radios (including an AFSATCOM satellite communications system set), instrument landing system gear, intercom and so on. The overall system weighs 2,270 kg.

The defensive avionics system is represented chiefly by the AN/ALQ-161 **electronic countermeasures system**, development of which began in 1972. The foreign press notes the following most important features of this system:

—From the very beginning of program realization, developers aimed at creating an integral system in which the functioning of ELINT receivers and jammers would be combined on the basis of a digital signal processor in the computer. Creation of a unified system of receivers and transmitters supports rapid system reaction.

—Multimode nature, i.e., the capability of countering fire control radars, surveillance radars, and surface-to-air and air-to-air missile guidance system radars operating in search, lock-on and target tracking modes.

—Supports the search and acquisition of new threat radar signals while simultaneously continuing to track and jam previously detected radars in the same frequency band.

—Controls jamming power from pulse to pulse.

—Uses reprogrammable data banks on targets and on the parameters of jamming signals. The system determines the purpose of each radar, evaluates its potential threat to the aircraft, and assigns a priority for neutralization, with priorities continuously revised as the situation changes.

—Uses phased array.

The AN/ALQ-161 prototype was tested for compatibility with the offensive avionics system and the flight control system on the B-1A aircraft. Ninety-five flights lasting 400 hours overall were made in the process of testing.

After the program for creating the B-1B bomber was renewed in 1981, the ECM system was considerably upgraded. The most important improvements include the following:

—An expansion in the operating frequency band (jamming equipment and radar detection receivers were included which have an upper limit of operating frequencies of 20 GHz as well as which overlap the low-frequency band down to and including 100 MHz);

—Use of digital storage providing for the generation of response jamming of pulse-Doppler radars;

—Introduction of equipment for detecting missiles in the rear hemisphere, which permitted giving up the initially planned tail protection radar.

The AN/ALQ-161 ECM system consists of 108 components (easily detachable units), over a third of which are antennas. The majority of units have a volume of 0.03-0.06 m^3 and a weight of 18-36 kg. They are located in easily accessible places and can be removed or installed by one or two specialists. The system's overall weight (less cables, control panels and indicators) is around 2,300 kg.

The system uses three phased arrays: one in the aircraft tail section and two in the leading edges of the wing panel root. Each phased array is 4.5 m long and covers a solid angle of 120° in azimuth (providing all-aspect jamming) and 90° in elevation. The phased array radiation pattern can change its spatial position in 1 microsecond. The phased arrays are used in high-frequency bands. The horn and blade antennas of low-frequency bands are situated in the forward and rear sections of the bomber and do not provide a broad overlap in azimuth. The output required by the ECM system with all transmitters turned on is 120 kw.

The AN/ALQ-161 has built-in monitor equipment which provides data on system status, and with the appearance of malfunctions or combat damage permits it to arrange the passage of signals, bypassing unserviceable units, so as to continue jamming the most dangerous targets. An important element of B-1B bomber avionics is considered to be the on-board integrated monitoring system, which supports measurement and inspection of more than 19,000 electronic gear parameters. In 65 percent of the cases this system makes it possible to detect a malfunction and localize it with an accuracy down to an easily detachable unit, and in other cases 95 percent of the malfunctions are localized with an accuracy down to four units. Subsequently it is planned to reduce the intensity with which undetected malfunctions appear in any easily detachable unit to a value of 3.2×10^{-7} per hour of flight.

The new **ADAMS automatic flight parameters registration system** (Airborne Data Multifunction Acquisition System) is installed in the B-1B. Over the last 15 years on-board digital tape recorders such as the MXU-533/A have been used on USAF aircraft to record flight parameters on magnetic tape at fixed time intervals. The mechanical part of such systems was a source of many failures. The new B-1B bomber system is built on the basis of microprocessor technology, which permits processing and compressing data being recorded aboard the aircraft. Programmable algorithms are used to set the threshold values, ranges, and rate of reading the parameters to be recorded. A parameter value is recorded only when it reaches a given limit; this significantly reduces the volume of excess inessential data, which previously comprised up to 80 percent of all data processed on the ground. Recorded data (111 flight parameters) are preserved for 15 minutes, 30 minutes and 11 hours preceding an air mishap. The 11-hour recording interval was introduced in connection with the fact that a malfunction which occurred long before a mishap can be the cause of an air mishap or accident. Data are recorded on solid-state media. The system storage capacity is one million bytes.

Much attention is given to organizing ground servicing of avionics. There are 212 easily detachable electronic units (out of 420) that are restorable. One hundred nine units are repaired at USAF bases using monitoring and testing equipment. The others are sent to special repair shops.

A characteristic feature of the program for creating the strategic B-1B bomber is considered the fact that necessary ground equipment was created in parallel with development of on-board avionics: simulators for training pilots, simulators of enemy electronics for training avionics system operators, and automatic monitoring and testing equipment. The presence of this equipment noticeably simplified and accelerated mastery of the new bomber by combat unit personnel, but foreign specialists note that the developers encountered many technical problems, some of which still have not been overcome. The greatest difficulties involve on-board avionics. USAF requirements and the potential capabilities of on-board avionics laid down in the R&D stage have been far from completely realized. Therefore the use even of operational aircraft will be fraught with serious limitations for a long time.

The most acute problems are connected with the functioning of the defensive avionics system because the system as a whole was not tested before the beginning of series production, since development and production contracts were concluded simultaneously.

The developers' concern is generated by an absence of repetition of ECM system testing results. For example, in some tests the system detects a threat source of emission, but with repeat tests under similar conditions it does not. The difficulty is that the system simultaneously jams and receives signals of the radar being jammed to monitor jamming efficiency, and this requires a very high level of isolation of receiving and transmitting antennas.

Another problem concerns the tail protection radar introduced to the ECM system. An unacceptably high level of false alarms is noted, which can lead to useless waste of chaff and flares, since the expendable passive jamming system operates from tail protection radar signals. The detection of attacking missiles was improved somewhat in the process of modifying the radar, but detection of slowly approaching aircraft continues to be difficult because of the small Doppler shift. The foreign press has reported that it was planned to install the ECM system in the first 55 aircraft without the tail protection radar. The radar will be installed on these aircraft after deliveries of all ordered bombers have been completed. Some of the series B-1B aircraft are fitted with an ECM system operating only in one of three 120-degree sectors. USAF representatives repeatedly stated that all incomplete work can be remedied by slight modifications in software, but completion of this work is postponed to later times from year to year. In addition, the combined functioning of offensive and defensive avionics systems is extremely hampered because of mutual interference. Therefore crews are forced to switch on only the system most needed at a given moment.

The greatest difficulties with the offensive avionics system involve operating the radar in a terrain following mode. Bugs in radar operation did not allow the USAF command to train flight personnel at the minimum altitude of 60 m as written in initial requirements.

The imperfection of the integrated built-in monitoring system presents some difficulty. In some sorties the system registered up to 30-40 false signals on equipment malfunctions. By the fall of 1987 it was proposed to reduce the number of false messages to ten per flight, and subsequently to three (the level prescribed by Air Force requirements).

Two crashes[1] which resulted in the loss of B-1A aircraft No 2 in 1984 and of B-1B aircraft No 12 in 1987 were major failures of the program for creating the strategic bomber. Investigations showed that in both cases the on-board avionics had a certain connection if not with the basic reasons, then with the seriousness of the consequences.

The first crash occurred during a test flight to evaluate performance characteristics at slow speeds. In ejecting, one crew member died and two received serious injuries. According to the official version, the crash occurred because of erroneous crew actions in practicing the nonautomatic version of fuel transfer to change the aircraft's center of gravity. On the B-1A and the first B-1B aircraft the yellow light signal that the center of gravity has gone beyond the limits of the permissible range was located in the lower part of the instrument panel next to the copilot's seat. It is assumed that the pilot did not notice the warning signal, since the light signal could have been covered by a knee. Rockwell proposed to install two light signals near the windshield in the field of view of both pilots. The light signals will be red beginning with the 19th B-1B aircraft. In addition, the light signal will be supplemented by a buzzer signal. It is also proposed to include a message in the verbal notification system about a dangerous change of the aircraft center of gravity in connection with fuel depletion.

The reason for the second crash was the collision of a B-1B bomber with a large bird (a pelican weighing around 7 kg). A crew of three instructors and three trainees was aboard for a training flight. At the moment of the collision the aircraft was flying at an altitude of 180 m and a speed of 1,030 km/hr. A fire broke out as a result of the collision, three of the four hydraulic systems were disabled and the aircraft became uncontrollable. The crash investigation commission established that crew actions were correct. Three crew members died: two were at supplementary work stations not equipped with ejection seats and were unable to abandon the aircraft, and the copilot was unable to eject because of an electronic circuit failure in the ejection system.

Flights of B-1B aircraft at altitudes below 1,500 m were suspended after this crash until a modification was made aimed at increasing aircraft survivability from a collision with birds. The modification program includes improved protection of fuel lines and the hydraulic system at three of the most vulnerable places on the aircraft using steel and kevlar plates. The strengthened constructions are designed for a collision with a bird weighing 4.5 kg at a speed of 300 m/sec. A number of improvements also will be made to the automatic ejection system.

The western press notes that the above technical difficulties are holding up mastery of the new strategic bomber in combat units. Modifications are being made to a number of on-board systems which do not meet Air Force requirements in the course of operation, which affects the state of combat readiness. For example, at the moment 52 aircraft were transferred to the USAF Strategic Air Command only one bomber was constantly on alert duty and the others could be used only for training flights. By 1990 it is planned to bring the number of B-1B bombers on alert duty to 30 percent. The aircraft fleet should be fully modified when there is an overall flying time of 200,000 hours, or tentatively by 1994-1995 (by which time all Air Force requirements for reliability and maintainability must be met).

Despite the fact that finishing work on existing on-board avionics of the B-1B bomber is far from complete, the USAF plans to install new electronic systems. In particular, the possibility is being considered of including the NAVSTAR satellite navigation system receiver and the MILSTAR communications system terminal in the avionics. A ground system for monitoring and analyzing parameters of on-board avionics intended for detecting malfunctions in the process of ground maintenance also is being developed. This expert system, which is based

on the use of artificial intelligence methods, should permit localizing a failure in 95 percent of the cases with an accuracy to an individual easily detachable unit.

In evaluating the B-1B bomber's on-board avionics, foreign military specialists note the high level of S&T ideas which went into it and the use of a modern component base and modern technology of electronics production. But capabilities of the on-board avionics will be realized to the full extent only in the 1990's.

Footnotes

1. Judging from foreign press announcements, two more B-1B bombers crashed in 1988—Ed.

British Martin-Baker Ejection Seats

18010693j Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 50-52

[Article under rubric "At the Readers' Request" by Col N. Mekhonoshin]

[Text] The problem of saving an aircraft crew in an emergency situation arose immediately after the appearance of aircraft. The first survival aid was the parachute, which in time turned into an inherent part of the personnel's flight gear. To some extent it ensured the survival of crews in emergency situations both in peace and wartime, especially when such situations are most probable as a result of combat damage to aircraft.

But the parachute has a number of shortcomings. Before using it, a pilot has to quickly exit the aircraft cockpit, which is not always possible, such as when the aircraft is executing a maneuver with a large positive g-load, when the cockpit canopy has jammed, when the pilot has lost consciousness because of the effect of the g-load or a wound, and so on. At low altitudes the parachute cannot ensure pilot survival inasmuch as there is not enough time for it to open. The parachute also may not open at too slow a flight speed, and loads on the pilot that are too high arise at excessively high speed. Using a parachute for survival at high flight altitudes is more advisable with respect to loads, but in this case protection against atmospheric conditions and an emergency oxygen supply are required.

The problem of crew survival became considerably more complicated with the development of jet aircraft, accompanied by an increase in flight speeds and aircraft maneuverability. Pilot ejection seats began to be developed for ensuring reliable survival; in an emergency they permit leaving the aircraft with the help of forces created by devices built into the seat, with subsequent survival by parachute.

The British firm of Martin-Baker became the pioneer in creating ejection seats abroad. It began work in this area in the late 1940's. In the time that has gone by since the first Mk 1 seat was ejected (1948), the firm essentially seized a monopoly on this kind of product on the world market. As of the end of 1987 it was putting out around 100 ejection seats monthly, which was almost 75 percent of their production in all capitalist countries. A total of over 68,000 ejection seats were built over 40 years, of which some 28,000 were in operation as of the end of 1987. Just one type of seat, the Mk 10, was produced in an amount of 5,700 units. Thirty of its variants presently are installed in 29 types of aircraft, including the British Sea Harrier and Hawk, the Anglo-French Jaguar (see color insert [color insert not reproduced]), the American F-18 Hornet and F-14 Tomcat, the Anglo-West German-Italian Tornado, the Swedish JAS 39 Gripen, the French experimental Rafale and others.

According to data of the West German journal FLUG REVUE, the lives of 5,600 pilots have been saved because of the use of Martin-Baker ejection seats in emergency situations. With the characteristic tendency of bourgeois society to evaluate everything in monetary terms, the journal cites the following financial calculations: the cost of training one pilot is around nine million West German marks and the ejection seat costs 150,000. According to these data, 50 billion marks were saved in saving 5,600 pilots through the use of ejection seats.

The first Martin-Baker Mk 1 ejection seat is equipped with a firing mechanism which ejected it and the pilot from the aircraft. To reduce flight speed and stabilize the seat, it was supplied with a stabilizing chute and a rescue chute was located in the seat bucket. Automatic equipment triggered the firing mechanism and released and opened the chute. To separate from the seat and open the rescue chute the pilot had to perform a number of operations independently. It was believed that with high altitude ejection the Mk 1 seat reliably saved the pilot in an emergency, but the absence of automatic equipment for separating the pilot from the seat and for opening the rescue chute reduced the seat's characteristics on the whole. In the 1950's the firm produced the Mk 2 ejection seat, which automatically ejected both at high and low altitude, but at high flight speeds the stabilizing chute was heavily loaded and created considerable negative acceleration for the pilot.

This shortcoming was remedied with the creation of the Mk 4 seat by using an interlock in the ejection initiation mechanism, which was triggered by a g-load and released the seat in 1.25 seconds at low speed or in 3 seconds at high speed depending on the degree of deceleration.

The objective of the firm's further developments was to create a seat which would ensure safe ejection from an aircraft on the ground. Such characteristics were realized to a certain extent in creation of the Mk 6 seat in the early 1960's. Previously used firing mechanisms accelerated the seat to a speed of 24 m/sec, which was clearly

insufficient for safe ejection on the ground, especially from VTOL aircraft at critical transition flight stages from the hover mode to horizontal flight. A set of ten rocket motors (boosters) accommodated beneath the chair bucket was used on the Mk 6 to supplement the firing mechanism. They would cut in simultaneously as soon as the ejection seat reached the end of its guides after the firing mechanism triggered. Operating for 0.25 sec, the boosters developed a thrust of more than 2 tons-force, thanks to which the seat would eject to a height of around 90 m relative to the aircraft. Such a seat was called a rocket ejection seat.

Judging from foreign press announcements, Martin-Baker achieved best results of creating ejection seats in the Mk 10, the basic features of which are as follows:

—Automatic, pneumatically controlled system of fixing the pilot's trunk, arms and legs on the seat, which in the process of flight gives him full freedom of movement but in an emergency situation leads to the optimum position for ejection by fixing him in this pose on the seat;

—An emergency oxygen supply system;

—Presence of a primary (automatic) and reserve (manual) system for controlling the ejection and opening of stabilizing and rescue chutes;

—Outfitted with a compact set of emergency-survival gear with an inflatable life raft automatically deployed and inflated when it contacts the water's surface;

—A guided main rescue chute which is very stable and gives the pilot a rate of descent during a landing within the limits of 6.5 m/sec.

But despite all modern technical solutions and the presence of devices in the automatic equipment which signal dynamic pressure (i.e., which take into account aircraft flight speed and altitude during an ejection) and g-load, the Mk 10 seat can function only within specific ranges of flight speeds and altitudes and g-loads. With the objective of broadening these ranges, it became necessary to create a system which, based on all available flight data in a specific emergency situation, would make the decision on the time of operation of the seat rocket boosters, the opening time of the stabilizing and main rescue chutes, and the pilot's requirements for an emergency oxygen supply.

The Mk 12 (produced in 1984, see figure [figure not reproduced]) and Mk 14 (1987) ejection seats use two retractable air-velocity tubes (put out after the seat exits the aircraft) as altitude and air speed sensors for measuring air flow speed and an accelerometer for measuring g-loads. The Mk 14 (it is installed in the American Hornet fighter in particular) uses an electronic selector for automatic selection of one of five ejection modes depending on flight altitude and speed. These modes differ chiefly in the moment in time for opening the main rescue chute.

Ejection using the Mk 14 seat has the following sequence:

—After the ejection control lever is pulled the pilot's shoulders and arms are fixed on the seat, the upper part of the cockpit canopy is jettisoned and the firing mechanism is triggered;

—The seat with pilot exits the cockpit, air-velocity tubes are put out, rocket boosters beneath the seat and on the firing mechanism cut in, the pilot's legs are clamped, and the oxygen supply system is triggered;

—The stabilizing chute opens to slow and stabilize the seat;

—The lower attachment points of the stabilizing chute separate and the seat stabilizes in a vertical position;

—In descending to a height under 1,500 m the main rescue chute is pulled from the container by a rocket micromotor and all connections between the seat and pilot's body are removed;

—Rocket micromotors separate the parachute container from the rescue chute and the seat falls to the ground less the set of emergency survival gear;

—The main rescue chute fully deploys.

Martin-Baker presently is continuing work to improve ejection seats. In particular, specialists' efforts are aimed at creating seats for highly maneuverable advanced fighters, which require consideration of the more and more complicated spatial attitude of the aircraft during ejection. Studies by the UK Royal Air Force Aviation Medicine Institute show that with high g-loads acting on the pilot in a highly maneuverable fighter, the most optimum body position is to have it tilted at an angle of 65° to the aircraft's normal axis, but that body position is extremely unfavorable for ejection in an emergency. Firm specialists hope to overcome this negative point in the Mk 14L electronically oriented ejection seat. The pilot sits straight up in this seat during normal level flight, but as soon as electronic sensors detect an increase in normal g-loads he tilts back to an angle of up to 65° from the vertical with the help of an electric drive. The sector of view remains unchanged inasmuch as the seat bucket also elevates simultaneously with a change in the pilot's position. The pilot only has to grab the ejection control lever handle and in 0.09 sec the seat returns to the initial position favorable for ejection.

Effective Combat Strength of Air Forces of Selected Capitalist States (Less NATO Countries)

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[Reference data[1] by Col Yu. Savichev]

[Text]

	Number of Squadrons (Aircraft, Helicopters in Them)[3]			
Country (Number of Combat Aircraft)[2]	Attack Aircraft[4]	Reconnaissance, Land-Based Patrol, Antisub marine, EW and Air-borne Early Warning	Transport	Special, Auxiliary and Training
1	2	3	4	5
Sweden (446)	18 (311)/5 (82 AJ-37), 1 (18 SK-37), 4 (68 J-35 & 4 SK-35C), 8 (139 JA-37)	4 (52)/3 (48 SA-37 & SF-37), 1 (2 Caravelle, 2 Sabreliner)	1 (8)/1 (8 C-130E & H)	. (around 280)/42 SK-50, 136 SK-60, 22 J-32, 50 SK-61, around 30 helicopters
Switzerland (272)	16 (268)/8 (135 Hunter), 6 (103 F-5E & F), 2 (30 Mirage III)	1 (18)/1 (18 Mirage III-R)	7 (101)/7 (28 SA-315, 70 SA-316, 3 AS-332)	. (251)/18 PC-6, 2 Do-27, 3 Bonanza, 40 PC-7, 116 Vampire (62 in reserve), 4 Mirage III, 68 P-3
Austria (23)	3 (23)/2 (15 Saab-105), 1 (6 J-35, 2 Saab-105)	3 (44)/1 (15 O-1E), 1 (12 OH-58B), 1 (17 AB-204)	. (34)/23 AB-212, 11 AB-206A	5 (73)/1 (24 Alouette III), 1 (11 PC-6B, 2 Sky-van), 1 (6 Saab-105), 1 (14 Saab-91D), 1 (16 PC-7 & O-1A)
Japan (340)	13 (330)/3 (80 F-1), 7 (121 F-15J), 3 (129 F-4EJ)	3 (25)/1 (10 RF-4EJ), 1 (10 E-2C), 1 (1 EC-1, 4 YS-11, T-33)	3 (50)/1 (30 C-1), 1 (10 YS-11), 1 (10 C-130H)	. (around 400)/1 (10 T-2, 2 T-33), 3 (31 MU-2, 40 KV-107), 10 (40 T-1, 50 T-2, 40 T-3, 60 T-33); . (2 F-15J, 3 F-4EJ, 2 F-104J, 2 F-1, 2 T-1, 2 T-2, 2 T-3, 2 T-4, 5 T-33A & C-1, 4 MU-2J & others)
South Korea (473)	23 (375)/2 (24 F-16), 16 (260 F-5), 4 (68 F-4), 1 (23 A-37B)	1 (10)/1 (10 RF-5A)	5 (39)/5 (10 C-54, 16 C-123, 2 HS-748, 8 C-130H, 3 Commander)	. (236)/20 T-28D, 33 T-33A, 39 T-37C, 20 T-41D, 35 F-5B, 63 F-5F, 26 UH-1
Taiwan (500)	14 (300)/14 (250 F-5, 50 F-104G)	2 (35)/1 (5 RF-104G), 1 (5 S-2A, 25 S-2E)	7 (93)/2 (20 C-47, 5 C-54, 1 C-118B), 3 (40 C-119, 10 C-123), 1 (12 C-130), 1 (5 Boeing 720 & 727)	. (278)/82 F-5A & B, 36 F-104D & G, 15 AT-3, 22 T-CH-1, 45 T-33, 25 T-34C, 10 Bell 47, 5 HU-16B, 12 UH-1H, 26 S-70
Philippines (62)	4 (46)/1 (10 F-5A & B), 3 (14 T-28D, 10 N-22B, 12 SF-260WP)	1 (3)/1 (3 F-27M)	5 (39)/1 (6 C-130, 3 L-100), 2 (3 C-47, 8 F-27), 1 (19 BN-2)	. (157)/1 F-28, 2 F-27, 67 UH-1H, 10 AUH-76, 1 S-76, 1 SA-330, 1 S-70AS, 1 Bell 212, 10 BO-105, 21 T-33 & T-34, 18 T-41D, 12 SF-260M
Indonesia (70)	4 (55)/2 (29 A-4), 1 (14 F-5E & F), 1 (12 OV-10F)	1 (9)/1 (3 Boeing 737, 4 HU-16, 2 C-130HMP)	4 (60)/2 (20 C-130, 2 KC-130B), 2 (7 C-47, 8 F-27 & F-28, 10 NC-212, 1 Boeing 707, 12 Cessna 207)	7 (129)/4 (15 Hawk, 23 T-34C, 40 AS-202, 12 Bell 47G), 1 (12 UH-34T), 2 (2 Bell 204B, 13 SA-330L, 12 Hughes 500)

Country (Number of Combat Aircraft)[2]	Number of Squadrons (Aircraft, Helicopters in Them)[3]			
	Attack Aircraft[4]	Reconnaissance, Land-Based Patrol, Antisub marine, EW and Airborne Early Warning	Transport	Special, Auxiliary and Training
1	2	3	4	5
Malaysia (58)	4 (58)/2 (38 A-4), 1 (4 PC-7), 1 (16 F-5)	1 (5)/1 (3 C-130HMP, 2 RF-5E)	8 (94)/1 (6 C-130H), 2 (13 DHC-4), 1 (2 HS-125, 2 F-28, 2 CL-600, 2 HU-16, 11 Cessna 402B), 4 (32 S-61A, 24 Alouette III)	4 (75)/4 (10 MB-339, 36 PC-7, 11 Bulldog, 4 S-61, 7 Alouette III, 7 Bell 47)
Thailand (143)	9 (143)/1 (14 F-5A & B), 2 (37 F-5E & F), 2 (28 OV-10C), 2 (27 AU-23A), 1 (15 A-37B), 1 (22 N-22B Missionmaster)	1 (9)/1 (4 RF-5A, 3 IAI-201, 1 Queen Air, 1 Commander)	3 (39)/1 (4 C-130H, 3 DC-8), 1 (12 C-123, 4 BAe-748), 1 (10 C-47, 2 Merlin IV, 1 Boeing 737, 1 King Air-200, 2 Bell 412)	7 (149)/1 (11 T-33A, 3 RT-33A), 1 (16 SF-260, 13 T-37B & C), 1 (11 T-41), 1 (34 O-1), 1 (18 S-58T), 1 (23 UH-1H), 1 (20 Airtourer)
Bangladesh (60)	4 (60)/2 (36 J-6), 1 (16 Q-5), 1 (8 J-7)	-/-	1 (5)/1 (3 Y-7, 2 DHC-3)	5 (81)/2 (36 CJ-6, 13 CM-170), 3 (12 Bell 212 & Bell 206, 11 Z-6, 9 FT-5)
Pakistan (338)	19 (328)/1 (16 Mirage III), 4 (62 Mirage V), 4 (41 Q-5), 9 (170 J-6), 2 (39 F-16)	1 (13)/1 (13 Mirage III-R)	2 (19)/1 (13 C-130B & E, 1 L-100), 1 (1 Falcon-20, 1 Bonanza, 1 King Air, 2 F-27)	. (153)/20 T-33A, 4 J-2, 2 Mirage V, 3 Mirage III, 2 J-6, 35 T-37C, 45 J-5, 12 CJ-6, 24 FTB-337, 20 Mushshak, 2 HH-43B, 4 Alouette III, 4 SA-321
Saudi Arabia (182)	10 (182)/5 (100 F-5), 2 (20 Tornado), 3 (62 F-15C & D)	2 (15)/1 (10 RF-5E), 1 (5 E-3A)	3 (105)/3 (35 C-130H, 8 KC-130H, 2 VC-130H, 9 L-100, 5 CN-235, 35 C-212, 2 Learjet, 2 C-140, 2 Gulf Stream III, 5 AS-61)	7 (163)/1 (8 KE-3A), 2 (25 AB-206B, 15 AB-205), 1 (29 AB-212, 17 KV-107), 1 (9 Hawk), 1 (30 BAC-167), 1 (30 PC-9)
Jordan (114)	7 (114)/4 (59 F-5E & F), 2 (35 Mirage F.1), 1 (20 F-5A & B)	-/-	2 (16)/1 (6 C-130B & H, 2 C-212A), 1 (2 Boeing 727, 2 Falcon-50, 4 S-76)	6 (116)/2 (16 C-101, 18 Bulldog, 1 C-212, 12 Warrior II, 6 Seneca II), 2 (24 AH-1S), 1 (18 S-76, 5 Alouette III), 1 (8 SA-342L, 8 Hughes 500)
Israel (677)	20 (599)/2 (50 F-15), 4 (113 F-4E), 4 (170 Kfir), 6 (145 F-16), 4 (121 A-4H & N)	4 (44)/1 (14 RF-4E), 1 (4 E-2C), 1 (6 Boeing 707, 3 RU-21, 6 RC-21, 2 EV-1E, 4 IAI-201), 1 (5 IAI-1124)	3 (61)/3 (9 Boeing 707, including 2 tankers, 21 C-130E & H, 2 KC-130H, 10 Arava, 19 C-47)	. (over 500)/27 TA-4, 10 Kfir, 16 F-4E, 94 CM-170 Magister, 40 AH-1S, 40 Hughes 500, 60 Bell 200 & Bell 212, 33 CH-53A & D, 9 SA-321, 17 UH-1D, 64 AB-206A, 4 BN-2, 20 Do-27 & Do-28, 45 Cessna, 12 Queen Air & around 100 other manned & unmanned flying craft
Egypt (441)	24 (402)/1 (9 H-6), 3 (54 Mirage V), 2 (33 F-4E), 4 (76 J-6), 1 (15 Alpha Jet), 2 (30 J-5), 8 (136 J-7), 2 (33 F-16A), 1 (16 Mirage 2000C)	4 (29)/2 (6 Mirage V-R, 14 J-7R), 1 (2 EC-130H, 2 Beech 1900), 1 (5 E-2C)	9 (134)/3 (21 C-130H, 10 Y-8, 9 DHC-5D, 3 Falcon-20, 2 Gulf Stream III, 1 Boeing 707, 1 Boeing 737), 1 (15 CH-47), 3 (27 Z-6), 1 (17 UH-12E), 1 (28 Commando)	. (around 300)/20 J-6, 29 Alpha Jet, 20 L-29, 5 Mirage V, 7 F-16B, 3 Mirage 2000B, 12 EMB-312, 75 SA-342L & around 80 other aircraft & helicopters

Country (Number of Combat Aircraft)[2]	Number of Squadrons (Aircraft, Helicopters in Them)[3]			
	Attack Aircraft[4]	Reconnaissance, Land-Based Patrol, Antisubmarine, EW and Airborne Early Warning	Transport	Special, Auxiliary and Training
1	2	3	4	5
Sudan (52)	5 (47)/1 (7 F-5E), 1 (18 J-5), 1 (10 J-7), 1 (6 J-6), 1 (3 BAC-167, 3 Jet Provost)	1 (2)/1 (2 C-212)	2 (57)/1 (4 C-130H, 4 C-212, 2 Falcon-20, 2 DHC-5D, 6 EMB-110), 1 (19 SA-330, 9 BO-105, 11 AB-212)	. (12)/4 J-2, 4 J-7, 2 J-5, 2 J-6
Somalia (66)	7 (63)/3 (12 J-5, 8 Hunter), 3 (8 J-7, 30 J-6), 1 (5 SF260W)	-/-	1 (22)/1 (4 BN-2, 4 Y-7, 4 G-222, 6 C-212, 2 P-166, 2 Y-5)	. (17)/2 J-2, 3 SF-260, 2 Cessna 150, 6 Z-4, 2 Z-6, 1 AB-204, 4 AB-212
Kenya (24)	2 (24)/1 (9 F5E & F), 1 (4 BAC-167 Strikemaster, 11 Hawk)	-/-	. (20)/5 DHC-4, 8 DHC-5D, 7 Do-28D	. (61)/8 Bulldog, 3 SA-330, 1 SA-342, 9 IAR-330, 40 Hughes 500
Republic of South Africa (324)	9 (179)/1 (5 Canberra), 1 (5 Buccaneer), 5 (31 Mirage-F.1, 104 Impala-1 & -2), 1 (19 Mirage III), 1 (14 Mirage F.1)	5 (53)/1 (7 Mirage III-R), 1 (8 C-47R), 1 (20 P-166S), 1 (4 Boeing 707), 1 (8 Wasp, 6 Alouette III)	3 (34)/1 (7 C-130, 9 C-160), 1 (2 HS-115), 1 (1 Viscount, 10 C-47, 5 DC-4)	16 (487)/3 (15 AM-3C, 25 C-4M, 20 Cessna 185), 6 (14 Super Frelon, 50 Puma, 80 Alouette III), 6 (80 T-6G, 39 Impala-1 & -2, 14 Mirage III, 12 C-47), 1 (30 Alouette II & III), 93 Impala-1 & -2 & 15 Kudu in reserve
Zaire (28)	3 (20)/1 (8 Mirage V), 2 (6 MB-326, 6 AT-6G)	-/-	3 (23)/1 (5 C-130), 1 4 C-54, 2 DC-6, 8 C-47), 1 (1 BN-2, 2 MU-2, 1 Falcon-20)	. (62)/8 MB-326, 9 SF-260, 9 Cessna 310, 12 Cessna 150, 6 Bell 47, 7 Alouette III, 9 SA-330, 1 AS-332, 1 SA-321
Nigeria (84)	4 (82)/1 (22 Alpha Jet), 1 (18 Jaguar), 1 (18 Type J-7), 1 (24 L-39)	-/-	5 (61)/2 (9 C-130, 3 F-27, 5 G-222, 6 Do-228, 1 Gulf Stream, 1 Boeing 727), 3 (18 Do-28D, 18 Do-128)	. (113)/2 F-27MR, 2 J-7, 12 MB-339, 1 P-149, 25 Bulldog, 14 Hughes 300, 44 BO-105C, 14 Puma
Morocco (109)	6 (109)/2 (38 Mirage F.1), 2 (26 F-5), 1 (23 Alpha Jet), 1 (22 CM-170)	1 (7)/1 (3 RF-5A, 4 OV-10)	1 (34)/1 (14 C-130H, 3 KC-130, 1 Falcon-50, 2 Falcon-20, 1 Gulf Stream, 9 King Air, 3 Do-28, 1 Boeing 707)	. (153)/24 SA-342, 7 CH-47, 27 SA-330, 24 AB-205A 20, AB-206, 5 AB-212, 4 HH-43, 22 CM-170, 10 T-34C, 10 AS-202
Mexico (103)	9 (103)/1 (11 F-5E & F), 6 (70 PC-7), 1 (12 AT-33), 1 (10 IAI-201)	1 (10)/1 (10 Commander-500)	6 (52)/5 (1 DC-7, 2 C-118, 4 C-54, 12 C-47, 3 Skyvan, 6 Islander, 4 Cessna), 1 (7 Boeing 727, 2 Boeing 737, 1 Electra, 1 F-27, 1 HS-125, 6 T-39, 1 Metro, 1 Merlin)	. (117)/8 Alouette III, 5 Bell 206, 5 Bell 205, 6 Bell 212, 2 SA-330, 2 AS-332L, 30 Bonanza, 34 Musketeer, 10 PC-7, 20 CAP-10B
Honduras (37)	3 (37)/1 (13 A-37B), 1 (12 F-5), 1 (12 Super Mystere)	1 (3)/1 (3 RT-33)	2 (39)/1 (2 C-130D, 9 C-47, 1 C-123K, 2 Arava, 1 Electra, 1 Westwind, 4 Commander, 1 Rockwell 1000, 2 DHC-5), 1 (1 Baron, 4 Piper, 11 Cessna)	3 (59)/1 (19 UH-1, 10 Bell 412, 4 Hughes 500, 5 TH-55, 1 Bell 47), 2 (4 C-101BB, 11 EMB-312, 5 T-41A)

Country (Number of Combat Aircraft)[2]	Number of Squadrons (Aircraft, Helicopters in Them)[3] Attack Aircraft[4]	Reconnaissance, Land-Based Patrol, Antisub marine, EW and Air-borne Early Warning	Transport	Special, Auxiliary and Training
1	2	3	4	5
El Salvador (29)	2 (23)/1 (8 Ouragan), 1 (5 AC-47, 10 A-37B)	1 (10)/1 (10 O-2A)	1 (12)/1 (6 C-47, 1 DC-6B, 3 IAI-201, 2 C-123)	. (78)/50 UH-1M & H, 9 Hughes 500, 3 SA-315, 3 Alouette III, 7 T-41, 6 CM-170
Venezuela (103)	7 (103)/1 (10 Canberra), 1 (17 F-5), 1 (19 T-2D), 1 (10 Mirage III & V), 1 (24 F-16A & B), 1 (11 OV-10E), 1 (12 EMB-312)	-/-	3 (39)/1 (5 C-130H, 6 G-222), 1 (4 King Air, 7 Queen Air, 10 Cessna), 1 (1 Boeing 737, 1 DC-9, 1 Learjet, 2 Gulf Stream, 2 Falcon-20)	. (67)/10 Alouette III, 14 UH-1D & H, 2 Bell 412, 18 EMB-312, 23 T-34
Brazil (215)	8 (146)/2 (17 Mirage III), 3 (31 F-5), 3 (98 AT-26)	7 (62)/2 (8 RC-95, 12 RT-26), 1 (8 S-2E, 7 S-2A), 4 (3 RC-130, 14 EMB-110B, 10 EMB-111)	13 (169)/1 (9 C-130E & H), 1 (2 KC-130H, 4 KC-137), 1 (12 C-91), 1 (23 C-95A & B), 1 (20 C-115), 1 (2 VC-96, 1 VC-91, 11 VC-93, 5 VU-9, 5 VC-97), 7 (7 C-115, 68 C-95)	. (around 300)/7 T-25A, 5 SA-330, 30 UH-1H, 117 T-27, 44 AT-26, 4 C-42, 18 Bell 47, 2 HS-125, 2 C-95, 4 EC-95, over 60 helicopters
Chile (96)	6 (92)/2 (32 Hunter), 1 (16 F-5E & F), 2 (28 A-37B), 1 (16 Mirage-50)	2 (5)/2 (2 Canberra-PR.9, 2 Learjet-35A, 1 King Air-100)	3 (42)/1 (1 Boeing 707, 1 Boeing 727, 2 C-130H, 11 Beech 99, 5 DHC-6), 2 (10 DHC-6, 5 Twin Bonanza) & 7 helicopters	. (122)/4 T-72, 12 T-36, 13 T-37, 6 T-41, 30 T-35A & B, 30 T-34, 10 DC-236, 8 UH-1, 3 S-55T, 6 SA-315
Argentina (139)	10 (139)/2 (38 Mirage III), 1 (8 Canberra), 2 (9 Mirage V, 23 Dagger), 3 (21 A-4P), 2 (40 IA-58)	-/-	6 (71)/5 (6 Boeing 707, 7 C-130E & H, 2 KC-130, 3 Learjet, 4 C-47, 13 F-27, 7 F-28, 6 DHC-6, 19 IA-50, 2 Merlin IVA), 1 (1 DHC-6, 1 LC-47)	. (163)/12 Hughes 500, 6 UH-1, 4 AS-315, 2 S-61, 2 CH-47C, 1 Bell 47, 6 Bell 212, 1 Sabre-liner, 6 Commander, 20 Cessna 182, 34 MS-760, 24 T-34C, 30 EMB-312, 15 IA-35
Australia (105)	6 (83)/2 (18 F-111C, 4 RF-111C), 3 (51 F-18A & B), 1 (10 Mirage III)	3 (24)/2 (20 P-3C), 1 (4 CA-25)	6 (72)/2 (24 C-130E & H), 1 (6 Boeing 707), 1 (15 DHC-4), 1 (4 DHC-4, 16 UH-1H), 1 (2 BAC-111, 2 HS-748, 3 Falcon-20)	. (182)/9 CH-47, 12 UH-1H, 14 S-70, 71 MB-326H, 8 HS-748, 5 PC-9, 48 CT-4, 18 AS-350
New Zealand (43)	3 (37)/2 (17 A-4G & K, 5 TA-4K), 1 (15 BAC-167)	1 (6)/1 (6 P-3)	3 (31)/1 (5 C-130H, 2 Boeing 727, 8 HS-747), 2 (10 Andover, 6 Cessna 421C)	. (49)/11 CT-4, 4 Air-tourer, 3 F-27, 7 Wasp, 15 UH-1H, 9 Bell 47

1. For effective combat strength of NATO air forces see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1989, pp 49-54.
2. Including combat aircraft at training and test centers, as well as in the reserve if not stipulated in column 5.
3. The numerator gives the number of squadrons, with the total number of aircraft in them shown in parentheses; in the denominator these data are broken down by types of aircraft.
4. Including bombers, fighter-bombers, attack aircraft and air defense fighters.
5. Including transport aircraft equipped for aerial reconnaissance missions.
6. Including combat trainer, trainer, search and rescue and other auxiliary aircraft and helicopters.

NATO Navies in Exercise Team Work-88

18010693l Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 57-62

[Article by Capt 2d Rank A. Lavrikov]

[Text] Cloaked in demagogic phraseology about "Soviet military superiority," the North Atlantic Alliance military-political leadership continues to build up the might of armed forces while paying very serious attention to keeping Army and Navy forces in a high state of combat readiness and improving their field, naval and flight training and readiness to conduct combat operations in any kinds of wars or armed conflicts. In the opinion of NATO military specialists, combat readiness is the determining factor in the transition from a peacetime to a wartime status and in timely execution of mobilization and operational deployment of armed forces, including naval forces.

At the same time, noting the considerable dependence of the course and outcome of combat operations in the European theater of war on normal functioning of transatlantic lines of communication over which reinforcing troops, supplies and materiel will be moved from the United States and Canada, the NATO command emphasizes that their uninterrupted nature also will largely involve the preemptive deployment of ship attack and antisubmarine forces in the East Atlantic, winning and maintaining superiority in the Norwegian and North seas, and reliably sealing off Warsaw Pact fleets in the Barents and Baltic seas.

Questions of naval warfare are regularly practiced to the fullest extent in the largest NATO exercises codenamed Team Work. Such an exercise was conducted in 1988 in the period from 29 August through 23 September. The area where it was held took in the North Atlantic, the Norwegian and North seas, English Channel and Baltic Approaches, and the territory of Northern Norway.

According to foreign press announcements, the primary objectives of the exercise were to test and work out in practice plans for conducting offensive operations in the Atlantic and in the Northern European sector using naval and marine force groupings established in these areas in a threat period; organize sealifts in the interests of armed forces of bloc countries in the Northern Europe sector; and coordinate ground, air and naval forces in the initial period of a conventional war.

As in past years, the following primary missions were practiced during the exercise: converting bloc allied forces from a peacetime to a wartime footing in accordance with the system of alerts in force in NATO; forming task forces and groups for various specific purposes, including the NATO Striking Fleet Atlantic; reinforcing the ground force grouping in Norway by landing amphibious forces over the beach; protecting ocean and sea lines of communication supporting the delivery of strategic reserves and military cargoes to Europe; providing air support to ground forces operating in coastal sectors and to landing forces when they conduct offensive and defensive operations; combating surface ship forces and submarines; preventing the deployment of enemy attack forces through the Iceland antisubmarine barrier and the Baltic Straits; organizing all kinds of defense of ship forces, landing detachments and convoys on the sea transit; organizing command and control, communications, reconnaissance, and logistic support; and practicing problems of electronic warfare.

Considerable attention was given to improving tactics of naval combat operations and to studying the combat stability of aircraft carriers operating from skerries areas under cover of the continental air defense system.

Participating in the exercise were commands and staffs of allied and national armed forces of NATO countries in the Atlantic and in the Northern Europe sector, a total of some 45,000 persons; up to 200 ships and auxiliary vessels, including the American multipurpose aircraft carriers "Theodore Roosevelt" (nuclear powered) and "Forrestal," the amphibious assault ship "Nassau," the amphibious helicopter assault ship "Inchon," as well as the British light carrier "Illustrious," and standing NATO naval forces in the Atlantic and minesweeping forces in the English Channel zone; over 500 aircraft and helicopters of the United States, Great Britain, Canada, the FRG, Norway, Belgium, Denmark, the Netherlands, Portugal and France; the 4th Expeditionary (USA) and 3d (UK) marine brigades; an amphibious battle group of the Dutch Navy; some units and subunits of ground forces and the Home Guard of Norway; forces and assets of the Northern and Atlantic zones of the NATO allied air defense system in Europe, and E-3 AWACS aircraft.

The basis of the exercise concept was one of the variants of initiating an armed conflict on the bloc's northern flank which provided for combat operations between the Blue (NATO Allied Forces) and Orange (the "enemy") on the territory of Northern Norway and in the Northeast Atlantic using conventional weapons. As in exercises of past years, war is initiated by the Orange, which begins moving up ground forces to the border with Norway and naval force groupings from the Barents and Baltic seas into the Norwegian and North seas in August under the guise of an exercise. Preempting the Blue's deployment, the Orange establish an Iceland-Faeroes islands-Norwegian coast antisubmarine and antiship barrier with the objective of preventing reinforcement of the force grouping of NATO Allied Naval Forces in the Norwegian Sea.

The Orange is first to begin combat operations on land and at sea. They conduct an offensive operation in Northern Norway and at the same time shift to combat operations to destroy force groupings of navies of NATO's European countries and disrupt Blue sea lines of communication in the Norwegian and North seas.

Having organized a transatlantic transit of U.S. and Canadian naval ships into the East Atlantic, the Blue forces penetrate the barrier, deploy their attack forces in the Norwegian Sea and deliver reinforcing troops to the European theater of war under their cover. At the same time the Baltic Strait zone is sealed off and an amphibious landing operation is conducted in Northern Norway with the objective of supporting the defending grouping of bloc ground forces. By joint efforts of ground, air and naval forces, the Blue forces seize the strategic initiative; win supremacy in the Norwegian Sea by conducting an operation (combat operations) to destroy Orange air-capable and antisubmarine force groupings; then launch an offensive in the continental theater and support the movement of second echelon troop reinforcements as well as supplies and materiel to the European theater of war.

The exercise took place in three phases. Its beginning was preceded by a preparatory period during which problems of immediate preparation of naval forces and the deployment to initial areas were practiced. A task force headed by the American flagship "Mount Whitney" of the U.S. Second Fleet (Fig. 1 [figure not reproduced]) was formed in the third decade of August 100 nm east of the Norfolk Naval Base (USA), and personnel, weapons and military equipment of the 4th Marine Expeditionary Brigade were loaded on landing ships of the U.S. amphibious forces at Moorehead City, North Carolina. At the same time aircraft of land-based patrol aviation were moved to forward air bases.

Security of the area where the task force formed was conducted in the 200 nm zone along the U.S. east coast by two hunter-killer forces (2-3 ships in each), a nuclear submarine, minesweepers of the ready reserve, Sea Stallion minesweeping helicopters, and land-based patrol aircraft. Up to ten patrol ships and small combatants and ten aircraft and helicopters from the U.S. Coast Guard also operated in the zone. Surveillance of the air and surface situation was provided by deck-based and land-based airborne early warning and control aircraft. The U.S. task force included a carrier striking force ("Theodore Roosevelt"), two landing detachments (amphibious helicopter assault ship "Inchon" and amphibious assault ship "Nassau"), and a ship striking force numbering up to 30 combatant ships and auxiliary vessels.

Operations by naval forces of NATO Western European countries assigned to take part in the exercise were characterized in this period by preparation of ship forces at bases and the beginning of their deployment to initial areas in the Norwegian and North seas. In particular, during 25-26 August the standing NATO minesweeping forces in the English Channel zone transited to the vicinity of Trondheim, Norway.

During the first phase of the exercise (29 August-5 September) measures were practiced for converting bloc armed forces from a peacetime to a wartime footing as well as an entire set of problems connected with moving reinforcements from the North American continent to Europe and organizing their protection and comprehensive support.

On 31 August the U.S. Navy task force together with a detachment of Canadian Navy combatant ships (five units) and a detachment of American depot ships of the 1st Squadron (four units), both of which had joined it the day before, began practicing (within the scope of a special exercise called United Effort) protection of ocean lines of communication and escort of the convoy across the Atlantic by the "moving zone of supremacy" method. The convoy was screened on the sea transit by combatant ships of the carrier striking force, two ship striking forces and the hunter-killer force of the United States and Canada, the cruising formation of which provided for the organization of antisubmarine, antiaircraft and antimissile defense. The alignment of the escort forces, with consideration of operations by deck-based and land-based patrol aircraft as well as E-3 AWACS aircraft, created a deeply echeloned zone screening protected forces against air and submarine strikes.

During the transit of the allied task force in the West Atlantic the carrier striking force (multipurpose nuclear carrier "Theodore Roosevelt") operated in rear sectors of the combat formation, practicing the organization of all kinds of defense on threatened axes. The cruising order was realigned with the force's arrival in the East Atlantic, with the carrier striking force taking up a position in the forward sectors at a distance of 40-100 nm. Special attention was given to organizing defense from the northeastern and eastern directions.

On 29 August redeployment of the U.S. Navy carrier striking force (consisting of the multipurpose carrier "Forrestal," three combatant ships and two auxiliary vessels) began from the Mediterranean for the purpose of reinforcing the grouping of Blue Allied Naval Forces in the Northeast Atlantic. According to foreign press announcements, when the distance between the two carrier striking forces was around 450 nm there was an actual practice of elements of a meeting engagement of the two carrier forces using deck-based aircraft.

With the beginning of the first phase of the exercise, naval forces of NATO's Western European countries began operational deployment to areas of combat tasking. The principal ship forces were concentrated in the Norwegian and North seas. A UK Royal Navy carrier hunter-killer force headed by the light carrier "Illustrious" (Fig. 2 [figure not reproduced]) patrolled the Iceland antisubmarine barrier.

In the second phase of the exercise (6-15 September) missions of forming the NATO Striking Fleet Atlantic, deploying it in the Norwegian Sea, and organizing and conducting the first operations to win sea supremacy

were accomplished and one of the most probable variants of the beginning of combat operations was played out. Primary attention was given to combating "enemy" submarines.

According to foreign press announcements, a special opposed-forces exercise of NATO Allied Naval Forces was conducted in the Iceland-Shetland Islands-south coast of Norway area, during which problems of conducting combat operations by the method of a "free game" were practiced; this method involves initiative actions by opposing forces within the scope of the episode being played and of a specific area.

The activity of Blue antisubmarine forces was aimed at preventing a penetration of Orange submarines through the Iceland-Great Britain antisubmarine barrier to move into the Atlantic. The submarines used the positional-mobile method and antisubmarine ships were consolidated in hunter-killer forces which operated both independently and in coordination with land-based patrol aircraft.

Formation of the NATO Striking Fleet Atlantic, which included up to 60 ships and auxiliary vessels including the carriers "Theodore Roosevelt," "Forrestal" and "Illustrious," the amphibious assault ship "Nassau" and the amphibious helicopter assault ship "Inchon" (Fig. 3 [figure not reproduced]), was completed south of Iceland on 8 September.

Subsequently Striking Fleet forces accomplished a breakthrough of the Orange antiship barrier in the Faeroes-Shetlands and Iceland-Faeroes sectors and were deployed into the southern part of the Norwegian Sea. By the end of 15 September Blue forces succeeded in constraining operations by Orange forces in the Norwegian Sea, partially destroying their ship forces and supporting the passage of an amphibious assault force to a landing area (Narvik, Norway).

In the period from 12 through 16 September the "Baltic phase" of the exercise was conducted in the Baltic Approaches and the western part of the Baltic Sea. The general concept of force operations reduced to repulsing an "enemy" attack, disrupting his landing operation on the Danish Islands, preventing the deployment of Orange ship forces into the North Sea, and supporting convoy escort in the North Sea.

In the third phase of the exercise (16-23 September) missions were practiced for maintaining supremacy in the central part and winning it in the northern part of the Norwegian Sea, as well as conducting an amphibious landing operation in Northern Norway, organizing coordination of marines and ground forces during offensive and defensive operations on the coast, and defending sea lines of communication in the Norwegian and North seas and the English Channel zone.

An amphibious force (over 8,000 U.S., UK and Dutch marines) was landed on the coast in the areas of Astafjord and Ufutfjord by a combination method during 16-17 September. The landing was preceded by air and gun fire preparation of the area by carrier-based aircraft, marine aviation and detachments of fire-support ships; and by surveillance-reconnaissance mine hunting and sweeping of coastal sectors accessible for landing by forces of ship minesweeping groups, including the NATO Standing Minesweeping Force in the English Channel zone. Antilanding defense of the landing area was the responsibility of units and subunits of ground forces and the Home Guard of Norway. Assault detachments were landed during hours of darkness using night vision devices. There was extensive use of EW equipment to create interference for the defending side.

Deck-based aircraft from the carriers "Theodore Roosevelt" and "Forrestal," the amphibious helicopter assault ship "Inchon," and the amphibious assault ship "Nassau" provided air support to ground landing forces during the operation.

In contrast to similar exercises of past years, the carrier forces maneuvered in protected (skerries) areas of Annfjord and Vestfjord.

The escort of a number of convoys was organized to practice problems of defending sea lines of communication in the Norwegian and North seas as well as moving reinforcements and logistic support items to Norway and the Baltic Approaches. Convoys and lone vessels usually were escorted behind sweeps in areas of mine danger, and after preliminary minesweeping in some sectors of the movement route.

Antisubmarine operations were practiced most actively on the Iceland barrier by ship hunter-killer forces operating together with land-based patrol aircraft and the SOSUS fixed long-range sonar surveillance system.

Problems of winning supremacy in the Norwegian and North seas were resolved using tactical aircraft operating from airfields of Norway and Great Britain. Strategic B-52 bombers of the U.S. Air Force Strategic Air Command conducted reconnaissance and surveillance of the surface situation in the Northeast Atlantic, laid minefields, and delivered strikes against "enemy" ship forces.

The NATO Allied Forces Exercise Team Work-88 was conducted in the immediate vicinity of the Soviet Union's borders and bore a provocative, antisoviet character. Its scope and direction as well as the problems worked in it attest to preparation of bloc armed forces for conducting chiefly offensive combat operations.

Close-In Weapon Systems

18010693m Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 62-70

[Article by Capt 1st Rank V. Nikolayev]

[Text] The development of naval forces of capitalist countries has been characterized in the last decade by broad adoption of new weapon systems in fleets, including antiship missiles with increased combat capabilities. Foreign specialists believe that the appearance of such missiles for air attack against surface targets produced a unique revolution in naval combat operations inasmuch as they have a very small radar cross-section (around 0.1 m^2) and they fly at superlow altitude at a rather high speed and execute complex maneuvers in vertical and horizontal planes on the terminal leg of the trajectory. All this creates rather considerable difficulties in combating them and dictates the need to expand R&D to create sufficiently reliable means of protection against this kind of weapon.

Within the framework of the concept of an echeloned air defense of ship forces and groups, close-in weapon systems [CIWS] with rapid-fire 20-40 mm guns and self-contained fire control subsystems are regarded as an important means of engaging antiship missiles attacking ships on the last line of defense. According to assessments of western specialists, such systems best meet requirements being placed on ship self-defense weapons: short reaction time, high probability of intercepting small targets, all-weather capability, as well as relatively light weight and small dimensions, permitting them to be installed not only aboard ships and vessels, but also on fast attack missile craft.

In analyzing the experience of naval combat operations during the Anglo-Argentine conflict near the Falkland (Malvinas) Islands, many foreign military specialists noted that rapid-fire small-caliber guns are capable of creating a dense fire screen in the shortest possible time along the course of an airborne target on a ship's close-in air defense line and in a number of cases can prove to be a more effective means of combating antiship missiles than a self-defense surface-to-air missile system. The high rate of fire (up to 4,200 rounds per minute) and short reaction time (no more than 3-5 seconds) of modern CIWS's permit achieving a high probability (close to 1) of one system destroying up to two antiship missiles attacking the ship at a short time interval at subsonic flight speed.

At the present time two basic concepts exist abroad on intercepting antiship missiles using a CIWS. One of them proposes to destroy the missile by detonating its warhead as a result of a direct hit by rounds having a kinetic-impact effect causing the explosive charge to detonate. Under the other concept the antiship missile is destroyed by inflicting serious damage on its airframe and functional subsystems, above all the homing head, as a result of the detonation near the missile of HE-fragmentation rounds with preformed submunitions made of high-density metal and with a proximity fuze. According to the first concept, an antiship missile with a warhead containing 200 kg of hexogen should be destroyed at a distance of at least 150 m from the ship to preclude nonrestorable damages to her antenna systems as well as general deformation and partial destruction of hull structures by the blast wave and missile fragments. In accordance with the second concept, the minimum intercept distance of the antiship missile with subsonic flight speed should be at least 600-700 m so that the damaged missile does not hit the ship in free flight along a ballistic trajectory.

Ships of navies of NATO countries and Japan use six types of close-in weapon systems; their specifications and performance characteristics are given in the table. The first of the above concepts is realized in the 20-30 mm Vulcan-Phalanx, Meroka, Seaguard, Goalkeeper and Samos CIWS, and the second in the 40-mm Dardo CIWS. Features of their design, layout and combat operation are examined briefly below.

Principal Specifications and Performance Characteristics of Automated Ship Close-In Weapon Systems of Navies of NATO Countries and Japan

Designation (Developing Country)	Depth of Kill Zone (Effective), km/Limits of Vertical Training Angle, degrees	Reaction Time, seconds/Typical Burst Length, seconds	Caliber, mm/ Barrel Length, calibers (Number of Barrels)	Overall Rate of Fire, rounds per minute/Projectile Muzzle Velocity, m/sec	Ready Unit of Fire, rounds/ Projectile Weight, kg	System Weight, kg: With Unit of Fire/Less Unit of Fire	Training Rate, deg/sec: Vertical/Horizontal
Vulcan-Phalanx (USA), Mk 15 Mod 0	0.2÷1.8/-25 ÷ +80	2÷3/3÷4	20/76 (6)	3,000/1,036	950/0.12	5,500/.	100/100
Mod 1	Same as above	Same as above	Same as above	Same as above	1,550/0.12	./.	Same as above
Meroka (Spain)	0.2÷1.5/-20 ÷ +85	3.5/2÷3	20/120 (12)	2,700÷3,600/ 1,215	720/0.12	6,000/.	86/115
Seaguard (Switzerland, UK)	0.1÷1.5/-15 ÷ +127	2÷2.5/1.6÷2	25/92 (4)	3,400/1,470	1,480/0.15	5,550/4,500	140/140
Goalkeeper (Netherlands)	0.4÷1.5/-25 ÷ +85	5÷6/2÷3	30/80 (7)	4,200/1,021	1,190/0.36	6,370/3,039	100/100
Dardo (Italy)	0.3÷3/-13 ÷ +85	9/.	40/70 (2)	600/1,000	736/0.875	7,000/5,200	60/90
Samos (France)	0.4÷1.5/-25 ÷ +85	./2÷3	30/80 (7)	4,200/1,021	1,190/0.36	5,600/.	100/100

The **Vulcan-Phalanx Mk 15 CIWS**, developed by the American firm of General Dynamics, is an all-weather automatic weapon system providing autonomous search and acquisition of targets in a designated sector of fire, assessment of their degree of threat, selection of the most dangerous target, lock-on, tracking and determination of its motion parameters, opening fire, automatic closed-loop fire adjustment, cessation of fire, and lock-on of a new target. The system consists of two functional subsystems with modular design (gun mount and radar fire control subsystem). Five modules (M61A1 gun with magazine, rotating mount with training mechanisms and base, barbette, radar antenna with servodrives beneath a radio-transparent dome, and a stand with computer cells) are mounted in one compact unit 4.7 m high occupying an area of 5.5 m^2 on the ship deck. The system also includes a remote control subsystem with panel and indication devices installed at the CIWS operator station.

The General Electric M61A1 20-mm six-barrel gun has a multibarrel arrangement with a block of barrels rotating continuously during firing; each barrel is designed for 6,000 rounds. The capacity of the magazine with a linkless ammunition feed method accommodated beneath the gun permits repelling several successive antiship missile attacks without replenishing the unit of fire. The gun with attached radar antenna module is mounted on a rotating cast aluminum mount with drives for training in two planes. The mount rests on a base through a ball race; the base is attached through shock absorbers to a barbette in which a two-channel radar, electric power unit, hydraulic unit and other gear are installed.

The pulse-Doppler radar operates in the 2 cm radio frequency band. Its transceiver is coupled with two antennas mounted one above the other. The upper antenna is used when the radar is operating in a target acquisition mode in the given sector, and the lower antenna in the tracking and fire adjustment mode. After the most dangerous target has been determined with the help of the computer, it is taken from the detection channel and handed over to the tracking channel antenna, which permits updating its angular coordinates and speed. Based on these data the fire control subsystem computer calculates the aiming point and issues commands to the gunlaying drives. Fire opens up automatically as the target approaches the established kill zone line. Simultaneously with target tracking, the radar

also begins to track the flying projectiles, which permits calculating by computer and automatically adjusting the angular divergence between directions to the cone of fire of projectiles and the target. This method of adjusting fire "with closed-loop adjustment"[1] considerably increases the likelihood of projectiles in a standard burst hitting a small target. In the automatic mode of combat work, which is the basic mode, the operator exercises only control functions. If necessary he can introduce necessary data manually through the remote panel's key-actuated control panel. The operator also opens and ceases fire against surface targets.

A Mk 149 subcaliber projectile with aluminum discarding sabot, nylon driving band and armor-piercing depleted uranium core around 12 mm in diameter is used as ammunition for engaging antiship missiles. The tip of the core nose is covered by a pointed ballistic cap of thermoplastic, which leads to a minimum loss of kinetic energy during the flight time to the target. Standard ammunition with HE-fragmentation projectiles is used in firing against other targets.

An upgraded model of the CIWS, the Mk 15 Mod 1 (Fig. 1 [figure not reproduced]) presently is being produced. In addition to an elongated magazine with increased capacity (by more than 50 percent), it uses a new radar search channel antenna with broad radiation pattern in the vertical plane for prompt detection of diving antiship missiles; the circuit for selecting targets against the background of signals reflected from the sea surface has been improved; and a new algorithm is used for controlling the rate of fire depending on the type of target being engaged. It is planned to modernize over 400 previously produced systems (Mk 15 Mod 0) as the Mod 1. It is planned to produce a total of over 800 of the Vulcan-Phalanx CIWS. By the beginning of 1989 the system already had been installed on more than 220 ships of various navies.

The **Meroka CIWS** (Fig. 2 [figure not reproduced]), developed on order of the Spanish Navy by the firms of Empressa Nacional Bazan and Experiencias Industriales, is a self-contained ship weapon system and is intended for self-defense of surface combatants against low-flying or diving air attack weapons. The CIWS includes two subsystems: a 12-barrel 20-mm gun mount and fire control radar subsystem. The gun mount uses barrels 120 calibers long of the Swiss firm of Oerlikon, hinged with a common breech ring and joined by four bands into a unit of two horizontal rows of six barrels each. The band located immediately behind the muzzle brakes can be shifted along the unit, which permits changing the mutual position of axial lines of the bores somewhat and thus optimizing the dispersion of projectiles with consideration of fire control system errors in a so-called concentrated burst. The latter includes 12 rounds fired in four volleys of three rounds each (or in other combinations) from spatially separated barrels. The gun has a belt feed system. The annular magazine of 720 rounds is located beneath the gun mount platform and is replenished from three ready-use ammunition lockers of 240 rounds each suspended on the outside of the turret base. It takes three minutes for a full reload.

The fire control subsystem, developed by the firm of Lockheed Electronics (USA), consists of two radars (acquisition and tracking), a television sight, digital computer and remote operator panel with display devices and controls. The RAN-12L acquisition radar operates in the 1-2 GHz band and can detect low-flying antiship missiles (radar cross-section of around 0.1 m^2) at a range of 12-14 km. It is coupled with an automatic threat assessment unit. The AN/PVS-2 coherent pulse-Doppler tracking radar with moving target indicator and antenna located on the turret operates on one of the frequencies in the 9.2-9.25 GHz band with quartz stabilization. The maximum tracking range for a low-flying target (radar cross-section up to 0.1 m^2) is 5.2 km.

The television sight serves for tracking the target, permits an operator to estimate firing results, and it is also used as an additional channel for determining angular target coordinates. If the AN/PVS-2 radar malfunctions the operator switches the system to manual remote control and tracks the target on a video indicator on his panel. In this case the distance to a target and target speed are input to the computer through the console's key-actuated panel, which is used for opening and ceasing fire and for inputting ballistic and meteorological data to the computer.

It is believed that no more than 10-12 concentrated bursts lasting 0.06-0.08 seconds and with an interval of 0.12-0.19 seconds between them, during which appropriate gun barrels are reloaded, will be required for destroying an antiship missile with subsonic flight speed. That mode of fire of the Meroka CIWS ensures pinpoint accuracy and permits intercepting 5-6 airborne targets without reloading the magazine. The antimissile munition consists of a subcaliber tracer projectile with discarding sabot and casing with 65-gram powder charge and an electric detonator.

A contract was concluded with the firm of Empressa Nacional Bazan for delivering 20 sets of the Meroka CIWS, which are being used to outfit the light carrier "Principe de Asturias," "Baleares"-Class guided missile destroyers, and "Descubierta"-Class guided missile frigates.

The **Seaguard CIWS** (Fig. 3 [figure not reproduced]) was developed on an initiative basis by an international consortium headed by the Swiss firm of Contraves. It has a modular design and an automated control system with distributed data processing using minicomputers built into the following modules: target detection, target tracking, weapon, system service, command and control. Their number and accommodation depends on the ship type and class.

Plessey Radar's Dolphin pulse-Doppler radar (UK) included in the detection module operates in the decimeter band with pulse-frequency coding and moving target selection. Its effective range is 35 km. The radar antenna, which is coupled with the IFF system antenna and mounted on a base stabilized on two axes, rotates with a frequency of 60 rpm and forms a two-lobed radiation pattern in the vertical plane. The radar can detect airborne targets within limits of 0-70° in elevation and at altitudes up to 14 km over the sea surface. The width of radiation pattern lobes is 1.5° in azimuth.

The target tracking module consists of a Siemens-Albis (FRG) monopulse-Doppler radar, a FLIR infrared system and laser rangefinder mounted on a platform stabilized on three axes with high dynamic response, as well as minicomputers and various electronic units accommodated in the underdeck space or in the superstructure. The radar operates in the 2-cm wave band and the scanning beam width is 0.9-1.1°. The working wavelength of the FLIR system is 10 microns. The laser rangefinder has a beam width of 2 milliradians and working wavelength of 1.06 microns. The integrated use of these sensors as well as the use of an adaptive work method and flexible change in radar frequency permit precisely determining current coordinates of low-flying targets in adverse weather conditions and under intensive jamming.

The weapon module includes an Oerlikon-Buehrle (Switzerland) Sea Zenith four-barrel 25-mm gun mount with four magazines accommodated below decks and an individual barrel feed belt system, as well as a minicomputer and local distribution board. The gun mount is stabilized on two axes and its ball race is on a barbette at an angle of 35° to the deck plane, which permits vertical training within limits from -15 to +125°. The presence of forced air cooling of the barrels ensures maintaining each barrel's rate of fire at a level of 850 rounds per minute with bursts lasting 1.6-2 seconds. Naval specialists estimate that Exocet antiship missiles can be destroyed by such a burst with a probability of 0.85-0.90. The unit of fire present in the magazines is sufficient for intercepting 14-17 missiles. Firing against antiship missiles will be accomplished by subcaliber projectiles with discarding sabot and tungsten core. The use of HE-incendiary projectiles is provided for repelling attacks by aircraft.

The system service module is accommodated below decks and is intended for transforming electrical power coming from the ship mains and for interfacing modules included in the CIWS with each other and with ship navigation subsystems through a data bus.

The command and control module is made in the form of a console with a high-level system of data display devices and a key-actuated panel; it is served by one operator, who merely monitors the status and functioning of tracking and weapon modules in the primary (automatic) combat work mode of the CIWS. Manual input of initial data and control of any system module is allowed.

At the present time the Seaguard CIWS consisting of one detection module, two tracking modules and three Sea Zenith gun mounts is being installed on four Turkish Navy "Yavuz"-Class guided missile frigates.

The **Goalkeeper CIWS** (Fig. 4 [figure not reproduced]), developed jointly by the Dutch firm of Signaalapparaten (prime) and the American firm of General Electric on order from the Dutch Navy, is a self-contained ship weapon system optimized for engaging antiship missiles on the final air defense line. The system's principal functional subsystems are the Sea Vulcan-30 gun mount and fire control radar. The gun mount and radar antenna are mounted in a compact monoblock on a single base, which precludes the effect of deformations of ship hull structures on firing accuracy with a heavy sea.

The Sea Vulcan-30 gun mount with drum magazine and linkless feed system was created by General Electric based on the GAU-8A series-produced seven-barrel 30-mm aircraft cannon with a barrel unit that continuously rotates during firing and has high reliability (around 33,000 rounds between failures and 150,000 rounds between stoppages in the gun and feed system mechanisms) and pinpoint accuracy (projectile dispersion when firing long bursts does not exceed 1.2 milliradians). The 1,190-round drum magazine rigidly attached to the gun mount platform is accommodated in a below-decks space, which provides safety for the crew replenishing the magazine with ammunition. An empty magazine is filled in 20 minutes using a simple mechanical device and in nine minutes using a bulk loader. That magazine capacity is considered sufficient for intercepting 6-7 targets. The principal antimissile ammunition is a subcaliber projectile with discarding sabot and tungsten core. Standard projectiles can be used for firing against other targets. Barrel life is 21,000 rounds when firing these projectiles.

The fire control system consists of two radars (search radar as well as tracking and fire control), computer, and portable operator console with display devices and controls.

The coherent-pulse search radar operates in the 3-cm band and detects small low-flying targets at a distance up to 20 km. A wave guide slit antenna as well as a side lobe suppression antenna situated above it are stabilized in two axes and rotate with a frequency of 60 rpm. They are installed on a console not mechanically connected with the tipping part of the gun mount, which in contrast to the Vulcan-Phalanx CIWS permits tracking other targets during firing in a track-while-scan mode. The probability of detecting small targets is improved by using methods of optimal filtration, digital pulse compression and fast Fourier transformation when processing signals in the radar receive channel.

The tracking and fire control radar operates in the 3 cm and 0.8-cm bands by monopulse and pulse-Doppler methods. A Cassegrain antenna 1 m in diameter located

on the tipping part of the gun mount forms two beams 2.4° wide in the first band and 0.6° in the second. The second beam, by which the target is tracked, is switched on immediately after target lock-on without scanning by the first beam. A television camera to one side of the antenna reflector permits the operator to observe the tracked target on the screen of the portable CIWS control console, assess firing results, and perform manual tracking in emergencies. Maximum effective range of the tracking radar is 14 km, and the accuracy of measuring target azimuth and elevation is 0.5 milliradians.

The general-purpose computer continuously evaluates data coming from the search radar for picking out airborne targets threatening the ship and computes their trajectories in the order of priorities given them, issues target designation for the tracking radar, and controls the stabilization system and gun mount servodrives. Based on data coming from the tracking radar the computer calculates complete training angles for the gun mount; uses a ranging burst for automatic system calibration, which permits precluding systematic firing errors before the target comes to within intercept range; issues the open-fire command and automatically adjusts the angular divergence between the cone of fire of projectiles and the target in a closed loop. According to the developing firm's evaluation, at least 12 rounds can hit the warhead of modern antiship missiles with a standard burst lasting some three seconds. Simulation conducted by the Dutch Defense Research Institute showed that the Goalkeeper CIWS is capable of destroying the first of two supersonic antiship missiles successively attacking the ship from one direction at a distance of 600 m, and the second at a distance of 400 m with a probability of 0.95.

The Goalkeeper CIWS is being fitted on Dutch "Kortenaer"-Class and "Jacob Van Heemskerck"-Class guided missile frigates. Fifteen sets were ordered from the firms by the British Royal Navy for installation on six "Broadsword"-Class guided missile frigates (second subgroup) and on three "Invincible"-Class light carriers (for replacing the Vulcan-Phalanx CIWS).

The **Samos close-in weapon system** (Fig. 5 [figure not reproduced]) developed by the French firm of Sageme is intended for combating low-flying and diving antiship missiles as well as aircraft in the ship's close-in air defense zone. It includes the seven-barrel Sea Vulcan-30 30-mm gun mount, which will be made in France under license from the American firm of General Electric; the Volcan electro-optical fire control subsystem; a launcher with four launching tubes for close-in surface-to-air missiles mounted on the tipping part of the gun mount; and a nongimballed inertial unit. The system will be coupled with the ship's air search radar and possibly with an IR reconnaissance set.

An electro-optical sight (weighing 80 kg) installed on the gun mount includes a rotating sighting head with stabilized mirror and optics forming a common optical axis of the sight, as well as a fixed section with television and infrared cameras and laser rangefinder. The mirror is stabilized by gyroscope. Mirrors in the fixed section of the sight separate visible, infrared and laser emissions passing along the common optical axis and send them to appropriate cameras. The vidicon television camera, supplied with an objective lens with variable focal length of 75-300 mm and focal ratio of 1:6, supports automatic target tracking in hours of daylight. The infrared camera has an objective lens with focal length of 180 mm and focal ratio of 1:2; it operates in the 8-12 micron wave band and tracks a target both in daylight and hours of darkness. The laser rangefinder with aluminum-yttrium-garnet emitter emits pulses at a frequency of 2-20 GHz. The primary operating mode of the Volcan system is automatic. Accuracy in tracking a small target is no more than 25 microradians. In the semiautomatic operating mode the operator exercises remote training of the gun mount by lining up the target image on the system control panel with crosshairs on the television and infrared camera screens.

It is proposed to use the Mistral missile with IR homing head as the surface-to-air missile in the system. The Samos system underwent firing tests at the French naval range near the city of Le Havre in October 1987.

The **Dardo CIWS**, created on order of the Italian Navy by the firms of Breda Meccanica and ELSAG in 1976, is the first foreign system optimized for combating low-flying antiship missiles and other air attack weapons. It also can conduct fire against seaborne and shore targets. The system includes the Breda Compact 40-mm twin turret gun mount, RTN-20X Orion tracking and fire control radar, computer and operator console. The CIWS is connected with the ship's RAN-10S air search radar and with navigation equipment.

The Breda Compact (Type 70) gun mount was chosen for the Dardo system because of complete automation of operation, relatively high rate of fire (600 rounds per minute) and grouping (angular dispersion 1 milliradian), short reaction time and high reliability. HE-fragmentation rounds with preformed submunitions in the form of 600 tungsten balls and a proximity fuze are used for firing against antiship missiles; foreign specialists believe this considerably increases the system's effectiveness.

The RTN-20X Orion coherent monopulse radar operates in the 3-cm wave band and is capable of locking onto a target at distances of 5-12 km (depending on the target size and antenna's height above sea level) based on target designation data which come from the RAN-10S radar operating in the 7.5-15 cm band. A Cassegrain antenna together with television camera for low light levels, stabilized for rolling and pitching, is mounted on a separate pedestal near the gun mount, which permits minimizing the effect of parallax and deformations of hull structures with wave action on firing accuracy.

The computer processes data coming from the acquisition radar, determines the target most dangerous to the ship, and issues a target designation to the RTN-20X radar, which after locking onto the target produces commands for automatic training of the gun mount and continues to process data on targets coming from the RAN-10S. During firing the computer adjusts fire based on data received from the RTN-20X radar, which simultaneously follows the target and the fired burst of rounds. In case intercept of a subsonic antiship missile begins at a distance of 3,000 m, the probability that the missile will reach the 700 m line is evaluated at 0.02, i.e., the probability of its destruction equals 0.98.

To modernize the Dardo CIWS Breda Meccanica created the Fast Forty 40-mm twin gun mount with a rate of fire of 900 rounds per minute and a new gun ammunition feed subsystem with two separate round feed channels. Cartridges with HE-fragmentation projectiles are supplied through one channel and rounds with fin-stabilized armor-piercing discarding sabot projectiles through the other. A supplementary magazine of two sections, each for 100 rounds, is located to the left and right of the tipping part of the gun mount and is filled with these rounds. This ammunition feed subsystem ensures realization of the new concept of employing small-caliber ship guns in repelling antiship missile attacks. In accordance with this concept it is planned to begin intercepting missiles at a distance of 3,000 m with HE-fragmentation projectiles with preformed submunitions and proximity fuzes, and after the 1,000 m line to shift automatically to firing subcaliber projectiles capable of causing the missile warhead explosive to detonate.

Naval specialists of NATO countries believe that entry of the automated CIWS with short reaction time, high reliability of intercepting and tracking small airborne targets against a background of natural and enemy-created interference, a sufficient rate of fire and sufficient firing accuracy into the inventory of surface combatants will substantially improve the effectiveness of combating present-day and future antiship missiles in the ship's close-in air defense zone.

Footnotes

1. For more detail on this see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 10, 1985, p 69—Ed.

Ship Order of Battle of Navies of Selected Capitalist States (Less NATO Countries)

18010693n Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 72-74

[Reference data[1] by Capt 1st Rank Yu. Kravchenko]

[Text]

					Small Combatants							
Countries	Submarines	Guided Missile Destroyers/ Destroyers	Guided Missile Frigates/ Frigates	Small Antisubmarine (Patrol) Ships (Corvettes)	Missile	Torpedo	Patrol	Landing Ships/ Landing Craft	Mine Warfare Ships	Total	Auxiliary Vessels and Craft	Grand Total
1	2	3	4	5	6	7	8	9	10	11	12	13
Sweden	12(3)[2]	-	-	-	30(4)	4	36	-/110[3]	69[4]	261(7)	52(1)	313(8)
Japan	14(3)	24 (4)/15	3(4)/13	-	-	5	9	9/37	41[5](4)	170(12)	109(2)	279(14)
South Korea	5[6](5)	5/6	5(1)/2	16(3)	11	-	70	15/17	9(2)	161(11)	17	178(11)
Taiwan	4	23/3	-/10	4	62(14)	-	44	27/22[7]	22[8]	221(14)	64	285(14)
Philippines	-	-	-/3	10	(1)	-	13[9]	32/74	-	132(1)	33	165(1)
Indonesia	2	-	7(1)/7	-	4	2(6)	25	15/62	2(2)	126(9)	49	175(9)
Malaysia	-	-	2/2	2	8	-	27	2/194[10]	4	241	27	268
Thailand	-	-	1/5	2(3)	6	-	60[11](3)	10 (1)/54	12	150	21(1)	171(1)
Bangladesh	-	-	-/3	-	4	4	29	-/4	-	44	11	45
Pakistan	6[12]	1/7	1/3(6)	-	8	4	17	-/2	3	52	11	63
Saudi Arabia	-	-	4/-	4	9	3	9	-/16	4	49	21	70
Jordan	-	-	-	-	-	-	5(3)	-	-	5(3)	-	5(3)

Israel	3	-	-	(4)	29	-	40	3/6	-	81 (4)	6	87 (4)
Egypt	12	-/1	4/1	-	25	3	15	12/12	9 (2)	94 (2)	34	128 (2)
Sudan	-	-	-	-	-	-	10	2/-	-	12	-	12
Somalia	-	-	-	-	2	4	5	1/4	-	16	-	16
Kenya	-	-	-	-	6	-	5	-	-	11	1	12
Republic of South Africa	3	-	-/2	-	9	-	30	-	8	52	11	63
Zaire	-	-	-	-	-	-	39	-	-	39	-	39
Nigeria	-	-	1/1	3	6	-	52	2/-	2	67	12	79
Morocco	-	-	1/-	-	4	-	11 (6)	4/-	-	20 (6)	2	22 (6)
Mexico	-	-/3	-/6	37 (4)	-	-	54[13]	-	-	100 (4)	16	116 (4)
Honduras	-	-	-	-	-	-	20[14]	-/4	-	24	1	25
El Salvador	-	-	-	-	-	-	31	-/3	-	34	1	35
Venezuela[15]	3	-	6/2	-	2	-	4 (3)	5/14	-	36 (3)	21	57 (3)
Brazil[16]	7 (2)	-/10	6 (4)/-	15[17] (1)	-	-	6	2/36	6	88 (5)	69	157 (5)
Chile[18]	4	6/2	2/-	3	2	4	3	3/2	-	31	13	44
Argentina[19]	5 (1)	6/-	6 (3)/-	6	-	2	5	1/14	6	51 (3)	27	78 (3)
Australia	6 (6)	3/-	4 (2)/5	-	-	-	20	7/-	3 (4)	48 (8)	44	92 (8)
New Zealand	-	-	-/4	-	-	-	8	-	-	12	8	20

1. For effective combat strength of NATO navies see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1989, pp 66-72.
2. Shown in parentheses is the number of ships (small combatants) already being built or for which construction orders have been placed.
3. In addition, 24 LCA Class craft with a displacement of 6 tons are part of Coastal Artillery.
4. Including 15 minelayers, 22 small minelayers, a tender, 6 minesweeper/hunters, 7 coastal minesweepers and 18 inshore minesweepers.
5. Including 2 minelayers and 6 minesweeping boats.
6. Three submarines with a displacement of 175 tons and two with a displacement of 70 tons.
7. In addition there are over 400 small assault landing craft of various classes.
8. Including 9 minesweeping boats.
9. In addition there are some 90 small patrol craft with a displacement of from 15 to 72 tons.
10. Including 165 fast landing craft (speed 30 knots, troop capacity 10 persons), built during 1986-1987.
11. There are 40 river patrol boats with a displacement of from 8 to 13 tons.
12. In addition there are 3 midget SX 404 submarines with a submerged displacement of 70 tons.
13. Including 11 river patrol boats.
14. Including eight river patrol boats.
15. Ship order of battle shown with consideration of Coast Guard. In addition, the National Guard has some 80 patrol boats assigned including river patrol boats.
16. The Brazilian Navy includes the carrier "Minas Gerais."
17. Including five river patrol ships and a monitor.
18. The Chilean Navy includes the cruiser "O'Higgins."
19. The Argentine Navy includes the carrier "Veinticinco de Mayo."

Restoring Traffic over Military Roads and Negotiating Difficult Terrain Sectors

18010693o Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 83-88

[Article by Col I. Polyakov, doctor of technical sciences, and Maj V. Ilyenko]

[Text] Part One of the article[1] discussed methods for restoring a passage across craters and for negotiating difficult terrain sectors, above all with soils having low supporting power. Prefabricated road mat layers are examined below based on open foreign press materials.

The desire to ensure maximum rates for preparing passages over difficult terrain sectors using prefabricated road mats led to the creation of special mat layers. The appearance of the first mat layers was connected with mission of rapidly preparing temporary airfields for the U.S. Air Force in World War II. Such vehicles were used for laying rolled-up flexible airfield mats or bituminous fabric on a prepared base, as well as surfaces of individual rectangular components joined in a strip and put together in the form of an "accordion." Two laying methods were used: feeding the mats across the layer cab as it moved forward (flexible mats) or pulling a mat strip backward off the layer's cargo bed, also with the layer's usual movement (flexible mats and mats assembled from individual rigid panels).

Prefabricated road mat layers appeared later in the ground forces, when support to the passage of troops (who had received large numbers of various pieces of equipment) ceased to meet requisite movement rates across difficult terrain sectors. The 1970's were the beginning of extensive production of layers abroad. Since then the armies of leading capitalist states have been receiving modern, high-capacity road surface layers. Specifications and performance characteristics of the principal ones are given in the table.

Principal Specifications and Performance Characteristics of Road Mat Layers

Designation, Manufacturing Country	Cargo Capacity of Base Vehicle, tons/Wheel Arrangement	Length of Set Carried, m/ Mat Width	Laying Speed, running meters per minute
Light road mat layer, UK	./4x4	45.7/3.35	13
Folding road mat layer, FRG	10/6x6 or 8x8	50/4.2	5
Flexible road mat layer, FRG	10/6x4	50/4.6	.
Prefabricated road mat layer, France	10/8x8	50/4.2	5
Flexible road mat layer, France	./6x4 or 6x6	.	.
Road mat layer, USA	./6x6	40/3.6	7

A prefabricated road mat layer (an improved version of what was used during World War II), which uses the principle of pulling off an accordion-fold mat from the cargo bed of the layer as it moves forward (Fig. 1 [figure not reproduced]), is presently in the inventory of the U.S. engineer troops.

The layer's primary work device is a pulling winch which can be used to independently assemble and load a laid mat on the bed. According to American specialists' calculations, an engineer platoon using the layer is capable of preparing a passage up to 300 m long in 45 minutes. Despite high productivity (the laying rate is up to 7 m/min), the layer also has substantial deficiencies: at the moment the mat is being laid the layer is moving over the surface of the soil (usually weak soil), which can cause it to get stuck. In addition, the layer is quite wide, the very same as for the prefabricated road mat.

British specialists have developed a layer devoid of these deficiencies, but it has a more complicated design (Fig. 2 [figure not reproduced]) incorporating a different laying principle. A flexible mat wound on a cylindrical drum is accommodated along the length of the vehicle's cargo bed in a traveling position, but before use it is turned 90° on a rotary platform and laid across the layer cab as the layer moves forward. The principal drawback is that the driver has no view of the terrain sector on which the mat is being laid ahead of the vehicle.

West German specialists took a somewhat different approach. The layer they developed transports and lays a mat similar in design but wider than the British one (by 1.25 m) as the layer backs up (Fig. 3 [figure not reproduced]).

The French layer (Fig. 4 [figure not reproduced]) is capable of laying a flexible road mat of reinforced (along the track width) synthetic material by moving either forward or backward. The foreign press notes as its deficiency the presence of a high-set cylindrical drum for rolling up the road mat and the device for rotating it when the mat is being laid or picked up. This leads to an increase in the layer's overall height and considerably hampers its use on rugged terrain and in the woods.

In the assessment of western specialists, layers developed jointly by FRG and French designers are the most advanced (Fig. 5 [figure not reproduced]). They permit laying prefabricated road mats of French and West

German manufacture transported by them in the form of packets 4.2x2.77 m in size viewed from above. The elements of these mats have a semirigid joint, which gives them increased efficiency in use. The layer's special equipment (guide boom, bed, main frame, device for laying and picking up the mat, winch) is mounted on the base vehicle, which can be a ten ton vehicle with high off-road capability.

The base vehicle's winch installed behind the layer cab is used for picking a mat up from an obstacle and loading it on the rotary platform. A device was developed for laying and picking up two types of mats: in the form of a three-dimensional grid with rollers that moves backward in a working position (see color insert [color insert not reproduced]), and in the form of three rigid guides (Fig. 6 [figure not reproduced]). The first design permits somewhat reducing the length of the layer in a traveling position and increasing the rear angle of overhang.

In laying the mat (Fig. 7 [figure not reproduced]), the layer is backed up to the spot where a passage is to be prepared. The mat packet on the bed is rotated 90°, the winch boom is raised and its flexible strap is fastened to the edge of the upper panel in the packet. The rear tow rope, passed through from below, is tossed over the laying device and fastened to the edge of the same upper panel in the packet. The mat moves beneath the layer's tires along the laying device by force from the rear pull rope. Then the rope is unhooked and, after backing up and pressing down the mat with its tires, the layer lays the entire packet. After the passage has been used the mat is dismantled in the reverse sequence; it is lifted to the rotary platform by the winch using the flexible strap as the layer moves forward.

Another layer developed by West German specialists has a somewhat different design. A hollow drum of square cross-section with the length of an edge equal to the length of the road mat panel being laid is used as the mat laying device. The drum is attached to the main frame by another frame, which is raised and lowered by hydraulic cylinders to a height equal to half the length of the drum's diagonal. The rotary platform mounted on the main frame (for accommodating prefabricated road mat panels) has an additional device for lifting the edge of the upper mat in the packet closest to the driver's cab to an angle of up to 45° after the packet is rotated 90°, which reduces force on the layer in laying the mat and makes the use of a pull rope unnecessary for picking it up from an obstacle after use. In a traveling position the drum is raised above the surface of the soil, which gives the layer necessary off-road clearance. The mat is drawn onto the drum and then beneath the layer's tires as the drum turns by the prime mover winch rope passed over the drum from below and fastened to the upper road mat panel. In backing up, the layer drives onto the mat. The force created forces the drum to turn and deliver a new mat panel beneath the layer's tires. The mat is picked up from an obstacle in the reverse sequence as the layer moves forward.

FRG road construction uses a layer of a rolled mat strip used for improving the working capacity of a temporary road whose service life has expired. The layer is assembled on the very same base as military layers and it has a main and rotary bed. A cylindrical drum with a rolled mat strip is fastened to the rotary bed. The strip laying device gives it even tension along the entire width and can be shifted to a working or traveling position. It is made in the form of a three-dimensional grid which moves backward in a working position similar to that shown in the color insert [color insert not reproduced]. This layer and strip can be used for laying synthetic fabrics in the top dressing of military roads.

A synthetic fabric laying device has been developed in the United States which can be mounted on transport vehicles. It has a frame with variable-length axis (for mounting fabric rolls of various widths), brushes and ribs helping to unwind the fabric from the roll without folds.

In an attempt to provide troops with a sufficient number of layers in the most important phases of combat operations and on terrain with a considerable number of sectors having soils with low supporting power, French specialists also developed a device for laying prefabricated road mats which can be mounted on a trailer or transport vehicle. It consists of a frame for stowing the prefabricated road mats and a drum with triangular cross-section for laying them.

To accomplish missions of preparing passages over difficult terrain sectors (above all on approaches to water obstacles and when preparing fords), NATO armies make use of various lift trucks and APC's of army subunits, for which special devices have been developed for transporting and laying prefabricated road mats both in front and in back of them (Fig. 8 [figure not reproduced]). In some cases existing motor vehicles in the subunits are used for these purposes. As they move they unroll the rolled-up synthetic mat with their bumpers (Fig. 9 [figure not reproduced]). A general view of a passage prepared by this method is shown in Fig. 10 [figure not reproduced].

Materials being published in the foreign military-technical literature indicate that western specialists are actively searching for new methods of restoring demolished road sections and supporting troop movement over difficult terrain and are developing new means for realizing them. A significant expansion in the product list of materials being used, rejection of mat assembly from small components, wide use of special layers, and a transition from treadway to continuous mats is noted.

Foreign military specialists believe that work in this area can substantially increase the combat capabilities of ground forces.

Footnotes

1. For the beginning of the article see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1989, pp 82-90—Ed.

U.S. Navy Amphibious Tanker Terminal Facility

18010693p Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 88-90

[Article by Capt V. Zatsepin]

[Text] The amphibious landing operation is one kind of offensive combat operation conducted by the Navy together with the Army and Air Force. The American command divides landing operations into three basic kinds depending on assigned missions and forces used: "invasion" (operation of strategic importance), "capture" (operational scale) and "raid" (tactical nature). Based on the experience of World War II and subsequent local wars as well as numerous exercises, western military specialists connect success in conducting them with various factors, including the completeness and uninterrupted nature of POL supply to the landing forces. In this regard the American Navy command attaches great significance to this question. For example, an offshore bulk fuel system (OBFS) has been created under Navy order for supplying petroleum products to amphibious landing operations (of the first two kinds) in poorly prepared theaters. The system includes two sets of equipment.

The first set, the tactical marine terminal, was developed in the 1960's and consists of offshore and shore equipment. Its offshore equipment (the basic components are mooring facilities and steel and rubberized fabric pipelines 150 mm in diameter) permits unloading tankers with a displacement of up to 25,000 tons at a distance of no more than 1,500 m from shore. The shore equipment includes soft tanks, pump units and other gear. It provides for receiving and storing fuel in rubberized fabric tanks with a cumulative capacity of up to 8,000 m^3 and supplying it to bulk motor transport. The tactical marine terminal equipment set is transported by Navy vessels and by Galaxy C-5B aircraft, it is set up by personnel and assets of an engineer company of an engineer support battalion of a marine logistic service team (setup time three days), and it is operated by a bulk fuel supply company from the very same battalion.

In the assessment of western experts, fuel consumption in a landing operation constantly grows and it can reach 3,000 tons per day with rebasing of Marine aircraft to the beachhead. At this stage capabilities of the tactical marine terminal no longer will fully meet modern demands, and in this regard it is planned for use only in the period of an amphibious assault force landing and widening of the beachhead. Subsequently to more fully satisfy the assault force's need for fuel it is proposed to deploy the second equipment set of the OBFS system, the Amphibious Tanker Terminal Facility (ATTF), development of which was completed in 1983, using the personnel and assets of an amphibious construction battalion of the assault landing force shore support team.

The ATTF set is intended for unloading tankers with a deadweight up to 70,000 tons. Pump units provide a capacity of over 1,000 tons per hour. This set's design permits it to be transported on landing ships and to be deployed without using floating marine cranes. The maximum weight of one piece of equipment does not exceed 63.5 tons and the maximum overall dimension is no more than 11 m. The ATTF can be set up at depths of 20-60 m up to 3,000 m from shore. It can be set up and a tanker moored with a sea state up to 3, and unloading can be done with a sea state up to 5. Without a moored tanker (after necessary preparations are made in connection with receiving a storm warning message) the ATTF is capable of withstanding a hurricane with a wind velocity up to 185 km/hr and a wave height up to 10 m.

The ATTF (Fig. 1) consists of a mooring buoy (pontoon), anchor arrangement, steel underwater pipeline, cap, and rubberized fabric hoses (connecting the pipeline, cap, mooring buoy and tanker).

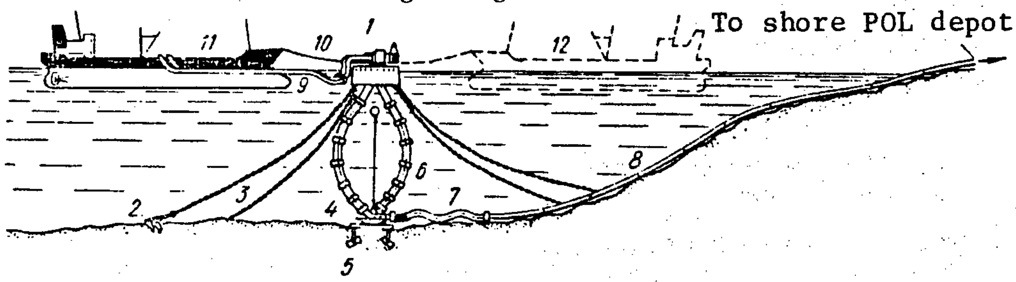
The mooring buoy (pontoon) has a rotating platform with two cantilevers in its surface part (Fig. 2). The hydraulic system pump unit driven from a diesel engine and a hydraulic plunger device for tightening anchor chains is mounted on one cantilever; on the other are two fuel pipelines 250 mm in diameter with quick-release connections for mating the flexible floating hoses, and a mooring line attachment point. The platform can rotate about the vertical axis on a cylindrical joint. Its design permits supplying fuel of two kinds to the pipelines continuously.

The buoy body is divided by watertight bulkheads into compartments, four of which are used as chain lockers for accommodating the free ends of anchor chains, while the others are filled with styrofoam. The large-diameter mooring line has positive buoyancy because of buoyant bodies on the end received by the tanker.

The anchor arrangement of the ATTF, designed for holding a force of 110 tons, consists of four steel 17-ton anchors with rotating blades and four 300 m chains.

The underwater pipeline is assembled from steel pipes 11 m long and with an outer diameter of 219 mm, the ends of which have threaded connections. Assembled in lengths, pipes are laid in two parallel lines, each extending up to 3 km. The pipeline is connected with the cap (kept on the bottom by two anchors weighing 10 tons each) with the help of two flexible hoses, each 72 m long and with an inner diameter of 200 mm.

Fig. 1. Diagram of ATTF



Key:
1. Mooring buoy (pontoon)
2. Anchor
3. Anchor chain
4. Cap
5. Cap anchor
6. Hose 500 mm in diameter
7. Hose 200 mm in diameter
8. Steel pipeline
9. Floating hoses 250 mm in diameter
10. Mooring line
11. Tanker
12. Permissible rotation of tanker under effect of wind and current

The flexible underwater hoses connecting the cap with the mooring buoy have an inner diameter of 500 mm and are equipped with attached floats which keep the hoses in the necessary contour.

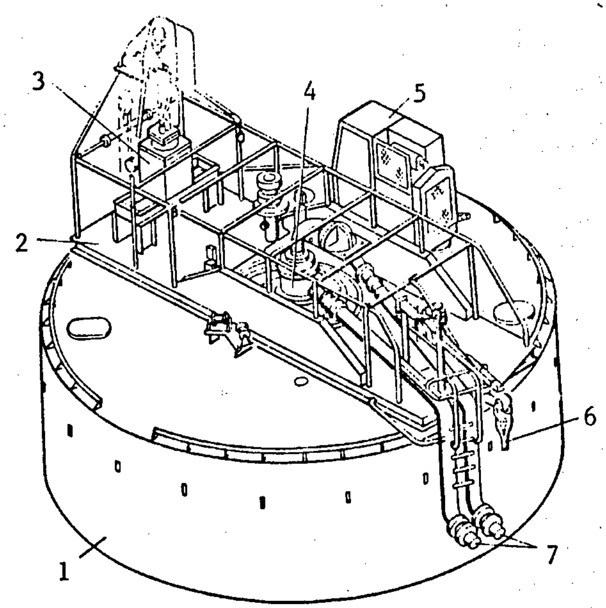
Judging from foreign press reports, in developing the ATTF set special attention was given to questions of organizing the work of deploying its equipment. During tests and exercises involving amphibious construction battalion personnel a procedure was worked out for setting up the ATTF in 17 days, during which the daily personnel requirement was not over 95 persons with a 10-hour workday. Each day up to four PCS/SLWT (Powered Causeway Section/Side Loadable Warping Tugs) from this battalion's authorized engineer equipment were used on the water together with nonself-propelled pontoons, and truck cranes, bulldozers, lift trucks with good off-road capability, air compressors and other equipment were used on shore.

In accordance with the developed sequence for installing the equipment, work begins with reconnaissance and preparation of a section of the seabed and beach. After this the steel pipes are assembled in 33 m lengths simultaneously with placement of anchors. The pipelines are laid in the sea using the PCS/SLWT's. According to calculations, laying begins on the fourth day after beginning of work and lasts five days. On the tenth day the cap is connected to the underwater hoses of the mooring buoy and to the rubberized fabric hoses of the pipeline, then lowered to the bottom, where the anchors are fixed. The buoy is kept in a certain position and the requisite chain tension is assured by a hydraulic device which begins functioning on the 15th day from the beginning of deployment. Work ends with the connection of the underwater and above-water floating hoses and mooring line to the mooring buoy.

The length of time for setting up the ATTF does not fully satisfy operational requirements and in the opinion of American military specialists must be cut to seven days. One way of attaining this goal is considered to be an improvement in work organization and an increase in its intensity, which can reduce deployment time by four days. A further reduction in work periods is to be achieved by design improvement of ATTF set equipment. The following are being considered as principal measures: installing a new pipeline cap, replacing the underwater rubberized fabric hoses with hundred-meter flexible metal hoses, accommodating a second anchor chain tensioning device on the buoy, and transporting and transloading the anchor chains in special packaging.

Judging from foreign press announcements, a search is under way for a new TOE for some Marine logistic support team subunits for effective use of a new fuel transfer system.

Fig. 2. Mooring buoy (pontoon)



Key:
1. Body
2. Rotating platform
3. Hydraulic arrangement for tightening anchor chains
4. Device for simultaneous supply of two kinds of fuel
5. Hydraulic system pump unit
6. Mooring line attachment point
7. Pipelines 250 mm in diameter

Spanish Arms Export

18010693q Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) p 90

[Article by Col Ye. Zorin]

[Text] The relative weakness of Spain's military industry (compared with developed capitalist states) does not allow it to produce modern advanced weapon systems. Military production is accomplished to a considerable extent under foreign licenses. Nevertheless, this is not keeping the country from building up the volume of military exports at rapid rates; the principal export items are military transport aircraft, combat trainer aircraft, frigates, patrol boats, recoilless guns, APC's and so on.

According to the Stockholm International Peace Research Institute (SIPRI) yearbook published in 1988, Spain moved to eighth place in the world in the volume of export arms sales. While this country's share of the world arms trade was only 0.2 percent in 1982, it reached 1.6 percent in 1987. During the five-year period from 1983 through 1987 Spain exported arms and military equipment worth over 513 billion pesetas[1] overall. Half of these deals were concluded with Near East countries.

But data cited in the yearbook do not take into account the trade in ammunition, explosives and small arms. As the journal INTERNATIONAL DEFENCE REVIEW notes, this business comprises no less than a third of the Spanish arms export (in monetary terms) and is of special interest to countries which the Spanish government includes in the so-called "blacklist," i.e., those to which it is officially prohibited to export arms. These are countries in a state of war or with dictatorial regimes.

In practice, however, such limitations often are not observed. In 1986 alone the Chilean junta received arms from Spain amounting to $350 million. In the opinion of foreign military specialists, the volume of this secret, illicit trade in Spanish arms (especially its re-export through third countries to Iran and Iraq, which at that time were in a state of war) exceeded 100 billion pesetas during that five-year period.

Footnotes

1. One U.S. dollar equals 142 pesetas based on the average exchange rate for 1986.

Japanese Air Force Final Exercise for 1988

18010693r Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) p 91

[Article by Col V. Samsonov]

[Text] The year's final Air Force exercise codenamed Shoen-63 was held in Japan from 29 September through 15 October 1988. It was directed by Lt Gen Atsushi Tani, commander in chief of the Combat Air Command.

The exercise area took in the territory of the Japanese Islands as well as sea and ocean water areas adjoining them. Transferring the Air Force to higher states of combat readiness, its operational deployment, an antiair operation, a struggle to win air superiority, as well as defense of air bases and other missions were practiced during the exercise. Large and small units and subunits of the Combat Air Command, a security and weather service air wing, a search and rescue air wing, a signal brigade and the Air Force intelligence center as well as units and subunits from the Air Training Command, Air Technical Training Command and Logistic Command took part in it.

In addition, armed forces branch staff operations groups; surface-to-air missile, AAA and other units and subunits of the ground forces; combatant ships of the Navy; as well as USAF Fifth Air Force units and subunits were involved in the exercise.

A total of over 31,000 persons, 550 combat and auxiliary aircraft including 60 American aircraft, and 30 combatant ships took part.

Under the Japanese Armed Forces operational and combat training plan for 1988, Air Force exercise Shoen-63 was conducted simultaneously with the final naval exercise Kaien-63 (28 September-12 October 1988). In the assessment of Japanese military observers, these exercises were the first joint maneuvers of the two branches of Armed Forces organized with the objective of practicing coordination between the Navy and Air

Force under conditions approximating a combat situation to the maximum. Joint Navy and Air Force maneuvers peaked in activity during 6-8 October 1988. In this period 200 Air Force combat aircraft and 30 ships were used to work missions of air defense of a sea convoy being escorted along the Japanese east coast.

Participation of American aircraft in this exercise was characterized by an increased number of forces and assets, lengthened time periods and increased complexity of missions practiced jointly. According to an announcement in the information bulletin KOKU TSUSHIN, American Fifth Air Force units and subunits practiced the following missions in the period from 29 September through 6 October 1988: reinforcement of a U.S. combat aviation force in northern Japan by moving aircraft of the 18th Tactical Fighter Wing from Kadena Air Base (Okinawa) to Chitose and Misawa air bases (on the island of Hokkaido and the northern part of the island of Honshu respectively); joint combat operations with the Japanese Air Force under plans of the initial period of war (60 F-15 and F-16 combat aircraft from the U.S. 18th and 432d tactical fighter wings took part); command and control and coordination during joint combat operations and logistic support of the operations.

On the whole, foreign military specialists evaluate the Japanese Air Force final exercise as the largest in the history of similar operational and combat training measures and as a new step in organizing joint exercises of branches of this country's armed forces held in coordination with the U.S. Armed Forces.

Increased Firepower of U.S. Army National Guard

18010693s Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 91-92

[Article by Lt Col I. Aleksandrov]

[Text] According to American military press announcements, the first nine self-propelled MLRS multiple launch rocket system launchers have become operational with the Army National Guard (one of the reserve components of the Army). They are intended for engaging armored combat vehicles, artillery batteries, air defense weapons, command posts, communications centers, concentrations of personnel and military equipment in the open, as well as other enemy area targets at distances of over 30 km. The MLRS is a launcher (12 rockets in two containers) mounted on the tracked chassis of the Bradley M2 infantry fighting vehicle. According to foreign specialists' calculations, a launcher salvo can cover an area of around 25,000 m^2 (rockets with shaped-charge fragmentation warhead) or create a minefield (336 mines) 1,000x400 m in size (rockets with warheads filled with antitank mines).

The foreign press notes that the first National Guard subunit which began receiving these systems was the 1st Artillery Battalion (headquarters at Lawton, Oklahoma) of the 45th Field Artillery Brigade. It presently is equipped with M110 203.2-mm self-propelled howitzers.

MLRS deliveries are being made within the scope of the Army "unified forces" concept, which envisages unified planning, programming and financing for the organizational development of regular forces and reserve components (National Guard and Army Reserve). American military experts note that the absence of MLRS units and subunits in the National Guard up to the present time has considerably reduced the firepower of reserve formations.

In accordance with the Army-90 program for modernizing the Army, which also envisages the conversion of all regular and reserve formations to a new TOE, new elements have been introduced to division and corps artillery: the battery (nine launchers) and battalion (27 launchers) respectively. Considering these changes, the American leadership plans to complete conversion of the 1st Artillery Battalion to the new TOE in the near future and have three MLRS batteries with a total of 450 persons in its makeup. The battalion will be assigned to accomplish general support missions as part of the army corps field artillery brigade.

Considering reserve components as the primary base for building up the effective combat and numerical strength of regular ground forces in the initial period of strategic deployment of the Armed Forces, the American command presently plans to continue outfitting reserve formations with the MLRS so that by the end of 1992 all divisions and several separate artillery battalions of the National Guard will be fully outfitted with them.

Re-equipping Coastal Artillery Forts in Norway

18010693t Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 92-93

[Article by Capt 1st Rank V. Frolov]

[Text] Norway uses defensive works for screening administrative-political and economic centers, naval basing facilities and major ports as well as for an antilanding defense of the most important sectors of the sea coast; the bulk of these works were built back during World War II. Coastal defense forts, which usually

accommodate artillery, antiaircraft or torpedo batteries and which in the opinion of foreign specialists are equipped with obsolete weapons and equipment, make up their basis.

According to a program for modernizing the Norwegian coastal artillery, three new forts are being built in key areas of the country's northern and central coast (two in the Narvik area and one near Trondheim). Their chief armament will be modern 120-mm guns (ERSTA series) produced by the Swedish firm of Bofors. The tentative cost of building each fort is $95 million.

An individual ERSTA mount is a gun turret covered by an armored cupola and a multitiered underground facility located beneath it (see figure [figure not reproduced]). Here is where the turret traversing mechanism, ammunition dump, ammunition elevator, gunfire control system, power plant, air supply system, and containers of fuel and water are located. The gun crew consists of 11 persons.

The gun sites are being selected with consideration of relief and necessary camouflage measures are being taken. The terrain's protective features are being used for this in particular.

Tests of the ERSTA mount which took place near the naval basing facility of Harstad in February 1988 produced good results according to foreign press announcements. A rate of fire of 25 rounds per minute and a range of 27 km were achieved. Laying is supported by radar, laser and television equipment. It is planned to use conventional HE shells with delayed action fuzes.

It is proposed that a battery (10-12 guns) will be accommodated in the coastal artillery fort. It is planned to complete the program for modernizing coastal artillery by the early 1990's.

British Precision Approach Radars for the Norwegian Air Force

18010693u Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) p 93

[Article by Col R. Kazantsev]

[Text] The Norwegian Air Force command signed a contract worth 3.2 million pounds sterling with the British firm of Cossor for purchasing and setting up at the country's military airfields during 1988-1989 four sets of CR 62 precision approach radars of the radar GCA (Ground-Controlled Approach) landing system, which has become widespread in many capitalist states. These systems operate in the centimeter radio frequency band and have small antennas. This permitted making them in a transportable variant even on condition of the use of cumbersome installation and of tubes.

A standard GCA system makeup includes an airfield control radar and landing radar as well as control tower equipment. At times landing radars are used independently and in some cases together with surveillance radars. The CR 62 is a transportable module-container which includes an azimuth and an elevation antenna and transceiver (see figure [figure not reproduced]). Displays (screen diameter 40.6 cm) with two operator work stations are accommodated at the airfield or air base control tower up to 300 m from the container.

The effective range of the precision approach radar is 28 km. The azimuth and elevation antennas have a beam width of 0.5°, a scanning angle from -1 to +6° in elevation and from -10 to +10° in azimuth, and a scanning cycle of one second. The radar operates at a frequency of 9,080 MHz, the transmitter power output is 65-85 kw and the receiver bandwidth is 8 MHz. The radar resolution is 60 m in range, 0.08° in azimuth, and 0.06° in elevation.

Judging from foreign press announcements, the CR 62 precision approach radars, which have been series-produced by Cossor since 1985, are the primary radars in radar landing systems with which Royal Air Force airfields are outfitted.

Strengthening the NATO AWACS Command Logistic Facility

18010693v Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 89 (signed to press 8 Feb 89) pp 93-94

[Article by Col L. Konstantinov]

[Text] A new SSTF (Software Support and Training Facility) complex became operational in the summer of 1988 at Geilenkirchen Air Base (FRG, Land Nordrhein-Westfalen), an operational base of the NATO AWACS Command. According to an announcement by the West German journal WEHRTECHNIK, it consolidates simulation equipment, computer software and communications equipment. A second aircraft simulator as well as a special on-board radar for operator training were installed during creation of the SSTF complex at the air base. The radio and radiotechnical equipment of the complex permits maintaining constant communications with E-3A airborne early warning and control aircraft on alert duty and with posts of the NADGE NATO Allied air defense system in Europe, and its computer is connected to the NATO programming center.

The SSTF complex is used for training crews of E-3A aircraft and operators of on-board equipment, for improving their skills, and for maintaining combat

readiness. Certain ground specialists of the NATO AWACS command—computer operators, programmers and communicators—also train on it. Foreign military experts believe the new complex makes it possible to reduce the number of training flights, which reduces training cost and improves efficiency without degrading quality. It can serve to check the coordination of different national units and subunits in the NATO air defense system and to ensure interchangeability of their personnel.

Within the scope of a further upgrading of the Command's activity, three Boeing 707-320C aircraft were purchased from a Belgian airline and are being refitted so that they can be used for training E-3A crews (which takes up to 17 percent of the flight time of such aircraft) and as military transport aircraft for improving the supply of the Command's forward air bases in Norway (Orland), Italy (Trapani), Greece (Preveza) and Turkey (Konya). To this end the very same flying and navigation systems are being installed in the Boeing 707 cockpit as in the E-3A and a wide cargo hatch is being installed in the front part of its fuselage. In addition, the aircraft are being equipped with an aerial refueling system as well as with an auxiliary power plant for supplying the increased demand for electrical energy.

The first of the refitted Boeing 707 aircraft, which have been given the index TCA (Training Cargo Aircraft), was transferred to the NATO AWACS Command in July 1988 and received a Luxembourg registration number.

Articles Not Translated from ZARUBEZHNOYE VOYENNOYE OBOZRENIYE No 2, February 1989

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